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ABSTRACT

This study identifies effective teacher strategies associated with student engagement in natural classrooms. "Student engagement" is defined as observable interest and/or attention to a learning task prescribed by the teacher. Twenty-four teachers and their students in the third and fourth grades in nine elementary schools in low-income areas in the San Francisco Bay area were observed on 10 occasions during the 1971-72 school year. Student engagement, teacher strategy use, and the relationship between them were analyzed. The major findings were that a) there were large differences in level and mode (receptive or expressive) of engagement among classrooms and among observation rounds; b) the frequency of strategy use varied among teachers and for individual teachers from one observation round to another; c) the mean percentage of students engaged rose significantly during the year; d) there were no significant differences in level or type of engagement by sex or ethnicity of students, or by subject matter; e) level of engagement differed significantly by size of instructional group, with lower levels for large groups than for small or dyadic groups; and f) level of engagement in the classroom was not clearly related to the use of particular strategies. The findings point to the importance of molar instructional and environmental settings as factors in engagement. They suggest a modification of the conceptual orientation of the study. (Author)

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STANFORD CENTER
FOR RESEARCH AND DEVELOPMENT
IN TEACHING

Research and Development Memorandum No. 105

# TEACHER STRATEGIES AND STUDENT ENGAGEMENT IN LOW-INCOME AREA SCHOOLS

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with Mary Lee Thomson
and Marsha Alper, Ann Bouie, Terre Delgado,
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## Introductory Statement

The Center's mission is to improve teaching in American schools. Too many teachers still employ a didactic style aimed at filling passive students with facts. The teacher's environment often prevents him from changing his style, and may indeed drive him out of the profession. And the children of the poor typically suffer from the worst teaching.

The Center uses the resources of the behavioral sciences in pursuing its objectives. Drawing primarily upon psychology and sociology, but also upon other behavioral science disciplines, the Center has formulated programs of research, development, demonstration, and dissemination in three areas. Program 1, Teaching Effectiveness, is now developing a Model Teacher Training System that can be used to train both beginning and experienced teachers in effective teaching skills. Program 2, The Environment for Teaching, is developing models of school organization and ways of evaluating teachers that will encourage teachers to become more professional and more committed. Program 3, Teaching Students from Low-Income Areas, is developing materials and procedures for motivating both students and teachers in low-income schools.

This is a report of a study conducted in low-income area elementary schools in the San Francisco Bay area during the school year 1971-1972. The study is a component of Program 3 at the Center and deals with observations of teacher strategies and their effect on student engagement (attention to task) in natural classroom settings. The objective was to define and describe effective teacher strategies and other variables affecting engagement in the classroom.

## Acknowledgments

Many people helped us with this study--superintendents, principals, teachers, and students in the schools in which we gathered data. Several colleagues and friends at the Center contributed in various ways. We would especially like to thank Roger Williams and the members of the Audio Visual Unit and Janet Elashoff and the Methodology Unit.

Special thanks go also to the project observers for the skill and care with which they gathered data in the classrooms. Finally, for unfailing good humor, tact, and patience in handling administrative and technical tasks, we thank Janet Weston and her assistants, Joan Huff and Jean Ziebron.

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## Abstract

The purpose of this study was to identify effective teacher strategies associated with student engagement in natural classrooms. Student engagement is defined as observable interest and/or attention to a learning task prescribed by the teacher. Twenty-four teachers and their students in third and fourth grades in nine elementary schools in low-income areas in the San Francisco Bay area were observed on ten occasions during the 1971-1972 school year. A total of 240 observations were made for all teachers and a comparable number for students. Reliability of observations (percentage of interobserver agreement) ranged from 54 percent to 100 percent (mean of 88 percent) for student engagement and from 63 percent to 100 percent (mean of 90 percent) for teacher strategies.

Student engagement, teacher strategy use, and the relationship between them were analyzed. The major findings were: (a) there were large differences in level and mode (receptive or expressive) of engagement among classrooms and among observation rounds; (b) the frequency of strategy use varied among teachers and for individual teachers from one observation round to another; (c) the mean percentage of students engaged rose significantly during the year; (d) there were no significant differences in level or type of engagement by sex or ethnicity of students, or by subject matter; (e) level of engagement differed significantly by size of instructional group, with lower levels for large groups than for small or dyadic groups; (f) level of engagement in the classroom was not clearly related to the use of particular strategies.

The findings point to the importance of molar instructional and environmental settings as factors in engagement. They suggest a modification of the conceptual orientation of the study. A field approach is being developed to supplement the original stimulus-response conceptualization.

## List of Abbreviations

The following abbreviations are used on tables and graphs reporting teacher strategies:

| | |
|---|---|
| Chg.Act. | Changes Activity |
| Chg.S.M. | Changes Subject Matter |
| Surp. | Surprises |
| E.Man.M. | Encourages Manipulation of Materials |
| U.Vis.A. | Uses Visual Aids |
| Moves | Moves |
| Sh.Anim. | Shows Animation |
| Pers. | Personalizes |
| Smiles | Smiles |
| Touches | Touches |
| Listens | Listens |
| A.Suc. | Anticipates Success |
| R.I.A. | Rewards Individual Achievement |
| Orients | Orients |
| Sts./Exp. | States/Explains |
| Sums. | Summarizes |
| Comds. | Commands |
| P.Tsk. | Personalizes Task |
| Quest. | Questions |
| Chall. | Challenges |
| G.Fdbk. | Gives Feedback |
| Tests | Tests |
| F.Comp. | Fosters Competition |

# TEACHER STRATEGIES AND STUDENT ENGAGEMENT IN LOW-INCOME AREA SCHOOLS

Robert D. Hess and Ruby Takanishi-Knowles
with Mary Lee Thomson

## Introduction

This is an interim research report of a study of teacher behavior and other factors that are effective in engaging the interest of students in public schools. Student engagement is defined as observable interest and/or attention to a learning task prescribed by the teacher. We have assumed here that engagement with the education activities of the school is prerequisite to learning and academic achievement. Arousing and maintaining student interest is a continual and basic component of the teacher's role.

In low-income and minority communities, schools have often failed to offer relevant and stimulating educational environments that make sense to children and that they can relate to. Yet it is especially critical in these areas that the classroom experience engage the interest of the students. Some have not acquired the level of accomplishment in basic academic tools, such as reading facility, that enables them to use the materials and instructional methods typical for their grade levels. Children with unsuccessful school learning experiences, who have in boredom and frustration turned off to the school, challenge the resourcefulness of the teacher if they are to be convinced that school is a place where they can invest their interest and energy. In attempts to develop more successful efforts to equalize educational opportunity and achievement, the ability of the teacher to develop, select, and use strategies that more effectively engage the interest and efforts of students may be a critical factor.

In the rapid growth of new programs for minority and low-income students during the last decade, there have been many research and

Marsha Alper, Ann Bouie, Terre Delgado, Betty Dietz, Kalei Inn, Gerry Mercadante, Anne Morton, Terry Taylor, and Lucy Williams helped with the research and writing of this report.

developmental efforts to facilitate achievement by creating new instructional techniques or curricular formats and materials. The usefulness of these new materials, curricula, and technology depends, in our view, on establishing classroom conditions in which they can be used. The availability of new materials and innovations is obviously not sufficient in itself, and attention should also be given to the social and affective context in which learning is supposed to take place. No curriculum can be effective with students disenchanted by negative school experiences.

This study was thus focused upon one of the mediating processes--engagement--that affect teaching and learning in classrooms. Of special interest were the strategies that teachers use in low-income-area schools to engage their students and the relative extent to which these strategies are successful.

Underlying the study was an assumption that the teacher has the responsibility for establishing an effective educational environment. This assumption contrasts with the view that it is the duty of the student to attend to the teacher. It is a conception of the student as the educational consumer, selecting instruction or materials that are appealing and ignoring those that are not. The formats of mass media programs, such as "Sesame Street" and "The Electric Company," illustrate this approach. Motivation and interest are seen as a result of the program design rather than as properties of the student.

In the initial phase of the project, several objectives were established:

1. To formulate a conceptual framework for the study of conditions related to engagement in the classroom.
2. To develop instruments for measuring teacher strategies and student engagement.
3. To identify teacher strategies that are associated with student engagement and disengagement in natural classroom settings.
4. To study the relationship of contextual variables (size of instructional group, subject matter) to teacher strategies and student engagement.
5. To examine the relationship between pupil characteristics (age, sex, ethnicity) and levels of engagement.

6. To develop models for collaborative relationships between educational researchers and school staffs and for teacher feedback procedures based on data gathered by classroom observation.

The Problem

The purpose of this study was to identify effective teacher strategies and other factors associated with student engagement and disengagement in natural classroom settings. The problem can be stated in the following three questions:

1. What is the level and variability of student engagement and disengagement in sample classrooms?

This question focuses on descriptive information about level of and variation in student engagement and disengagement in natural classrooms. How does student engagement vary during the course of the school year? Are there differences between teachers in the level of student engagement in their classrooms? Are there differences associated with the sex and ethnicity of the student, instructional group size, or subject matter?

2. What strategies do teachers use in sample classrooms?

This question aims to provide information on teacher strategy use and on differences among teachers in frequency and consistency of usage.

3. What is the relationship between specific teacher strategies and student engagement in the classroom?

Once dimensions of student engagement and teacher strategies have been identified, we turn to the focus of this study--linking the occurrence of specific teacher strategies to observed student engagement in classroom learning.

Theoretical and empirical framework. Although a large body of prescriptive literature about teaching exists, teacher engagement strategies have not received much research attention (Maehr and Sjogen, 1971; Rosenshine, 1971). The prescriptive literature offers "how to teach" strategies based on generalizations from laboratory research, educational philosophy, theoretical orientations, and common sense. These suggested strategies are rarely based on research on teacher and student behavior in actual classrooms. With the exception of achievement motivation, little theory and research has focused on motivation in classroom settings

(Weiner, 1969). The work of de Charms (1971), Di Vesta et al. (1971), and researchers at the Wisconsin Research and Development Center for Cognitive Learning (Sorenson et al., 1970) represent some of the few attempts to relate motivational theory and research to classroom teaching.

A research paradigm. A research paradigm for studying the relationship between teacher strategies and student engagement is presented in Figure 1.

Teacher instructional strategies can be conceptualized as clusters of stimuli or behaviors transmitted by the teacher to affect the student in accordance with some objective (1). Teacher engagement strategies are a subclass of instructional strategies that can be separated, described, and observed in the classroom (2). Teacher strategies may be received by and lead to certain hypothesized inner states in the student (3). These states may include epistemic curiosity, dissonance, competence motivation, and achievement motivation. Finally, these states are manifested by specific, observable behavioral indicators of student engagement (4). Both student variables (3 and 4) may depend upon student characteristics such as sex and ethnicity (5). Observations of student engagement may provide some teachers with feedback (6), a basis upon which to alter their engagement strategies (2). One contextual variable (7)--size of instructional grouping--was used as a condition of teacher and student interaction. Contextual variables may affect the occurrence of certain teacher strategies (1 and 2) and student behavior (3 and 4).

In this study attention was focused on the observation of teacher engagement strategies (2), student engagement (4), and relationships between them. A Teacher Strategies Instrument and a Student Engagement Instrument were developed to measure these behaviors. The two enstruments are described in detail later in this report.

An empirical base for teacher engagement strategies. Theory and research on human learning, motivation, and teaching were reviewed in order to provide an empirical base for deriving teacher engagement strategies for this study. A number of teachers were interviewed about their strategies for engaging students. Generalizations about teacher behavior that might be related to student engagement were then drawn. From this

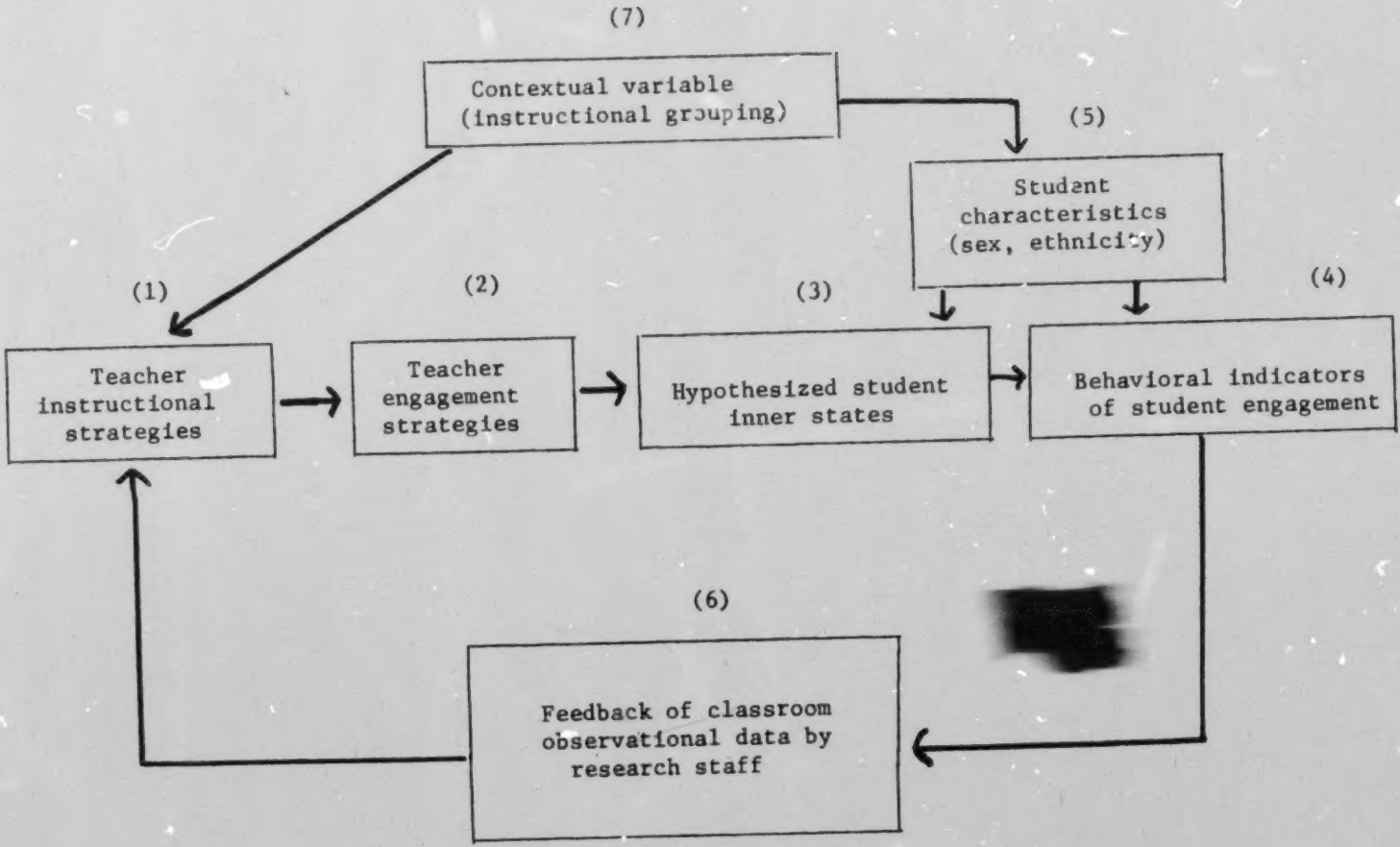


Fig. 1. Relationship between student engagement and teacher strategies: A research paradigm for the 1971-1972 study.

work, observable teacher behaviors were specified and became the basis of the Teacher Strategies Instrument.

Arousing student engagement in learning. Initial student attention to the task is logically essential for learning. Theory and research on novelty and curiosity motivation suggest that the teacher can manipulate properties of the environment to arouse and focus student attention. Berlyne (1963) argues that situations characterized by novelty (change, surprise), complexity (amount of variety or diversity in a stimulus pattern), and uncertainty have attention-arousing properties. These situations are hypothesized to lead to a motivational state of epistemic curiosity by the creation of a discrepancy between experience (informational input) and expectation (prior learning). Epistemic curiosity refers to a high arousal inner state that can be relieved by specific exploratory activities. Berlyne's curiosity theory is similar to cognitive consistency theory, which can be stated in terms of congruity and incongruity (Osgood and Tannenbaum, 1955), balance and imbalance (Abelson and Rosenbaum, 1958; Heider, 1946), or consonance and dissonance (Festinger, 1964). Schultz (1970) has discussed in detail elements involved in the arousal of the learner based on the creation of a discrepancy between experience and expectation.

In brief, several instructional applications can be derived from these and other writers: stimulus variability, novelty and surprise, and incongruity.

Coats and Smidchens's (1966) research suggests that variability of teacher behavior can have potent motivational effects on students. Teachers can introduce stimulus variability by using different kinds of instructional devices and materials, by changing activities within the lesson, by changing the instructional groupings of the students, and by varying the materials.

Teachers can present stimuli that are essentially "new" (novelty), or are sudden or abrupt in appearance (surprise). Distributing sealed envelopes, each containing a different number of straws, to a class and asking pairs of students to open their envelopes, count the straws, and perform all possible arithmetic operations on the two numbers, is an

instance of the use of novelty to enhance skill practice.

Incongruity is a condition in which the input is composed of stimulus elements not previously associated. For example, a teacher starts work on number bases by writing "2 + 2 = 2" on the board and asking the class "How can that be?"

These instructional applications are based on a substantial body of research that indicates that discrepancy leads to the arousal of the learner and that experience and expectations contribute to arousal. The reasons why discrepancies arouse the learner, however, are still a subject of disagreement (Berlyne, 1965; Mandler, 1964).

Maintaining student engagement in learning. Once student engagement is aroused, it must be maintained in order to lead to the acquisition of knowledge. If the creation of epistemic curiosity leads to sustained student involvement in learning, the discrepancy has led to a productive outcome. Habituation to discrepancy effects, however, with an accompanying loss of interest also occurs when the stimuli are constantly repeated (Davis, Buchwald, and Frankmann, 1955; Sharpless and Jaspar, 1956).

There are two implications of the habituation effect for teacher engagement strategies. First, a teacher cannot display the same behavior or patterns over an extended period of time and expect continued high student engagement. For example, if a teacher continually reinforces a child, this repetition may minimize the motivational power of reinforcement; in the Coats and Smidchens study (1966), students became habituated to a "dynamic" lecturer. The second implication is that the teacher should be modifying continually the discrepancies she presents to students. Bruner (1966) has referred to this process as the pacing or sequencing of optimal levels of uncertainty. In his discussion of the problem of the "match," Hunt (1965) notes that if the mismatch (discrepancy) is too great, the learner may become anxious and/or withdraw from the situation; likewise, if the mismatch is too small, the learner will either not attend to the stimuli or become bored. Thus, Hunt considers the problem of the match as highly important in teaching strategies. The teacher's task is to find the circumstances or conditions that will continue to interest the student in learning. This task involves

sensitivity to the student's background, needs, abilities, learning sets, and interests in order to predict which cues or arrangements of cues will be most interesting, as well as when they may be most interesting.

A specific means by which a teacher can reduce an initially large discrepancy for the student is by the use of advanced organizers (Ausubel, 1968) or learning sets (Harlow, 1949). These two means serve to direct the learner's attention to certain features of the stimulus complex and to provide him with some structure for incorporating new experiences. Teachers can create learning sets or organizers by pointing out the goals of the task, and by structuring the lesson by indicating how the task is similar to some previous task or to a more general learning task or experience.

A challenge of mastery or competition may also maintain student interest. The desire to assert or reaffirm competence or to show oneself more competent than others (as in spelling contests, for example, or in challenges to get a task done faster and/or better than previously) seem to have particular motivational force. These strategies present the student with a task neither too easy nor clearly above his capabilities. This type of match between his known competence and the challenge has considerable motivating power. It is, perhaps, an example of White's (1959) concept of effectance motivation, which "aims for the feeling of efficacy, not for vitally important learnings which come as its consequences."

A teacher may also maintain engagement by challenging the learner with inconsistencies in his answers or by presenting him with new or contradictory evidence. This process tends to create a new discrepancy once the previous one has been resolved. In this way, teachers may be cognitive models of engagement--modeling inquiry and exploration, asking divergent questions, and testing hypotheses. Rashid (1968) notes that the degree of skill with which teachers themselves deal with subject matter and the clarity with which they communicate this skill to children may be the basis for strong cognitive modeling in classroom situations.

Finally, feedback of information on the correctness or appropriateness of behavior is also a means of directing attention to correct

responses and of increasing their probability of reoccurrence. Thus teachers can use reinforcement as a means of creating the feeling of competence in the student. Reinforcement can be provided verbally, e.g., "Good!" or "You're doing a great job!" as well as nonverbally, e.g., smiling and/or affectionately touching a child. Teachers can personalize reinforcements according to their judgments of student needs and characteristics (Lesser, 1971). They can reinforce student initiative, curiosity, and exploration, as well as correct responses.

The data gathered in classroom settings in this study have provided a basis for testing these generalizations about teacher engagement strategies. The data describe ways in which teachers arouse and maintain engagement in their students and may provide an empirical base for training teachers to engage their students more effectively.

## Methods

### The Sample

Subjects for the study were twenty-four third and fourth grade teachers and their students in nine low-income area schools in the San Francisco Bay area of California. Table 1 shows the approximate composition of the student sample for each teacher. The figures are approximate in that data were gathered in observation instances rather than on individual children (see Observation Procedures).

The research staff recruited teachers from the schools after permission had been given by the district superintendents and the school principals. The staff presented the research goals and data-collection procedures to teachers in each school. Those who expressed interest in participating were accepted into the sample.

Each of the nine schools provided demographic information on student populations. Census data were also obtained for the communities surrounding each school. Detailed information on income level and occupation of parents, school classification level, and ethnic composition of school populations can be found in Appendix A. Based on these criteria, each of the schools can be classified as low-income.

TABLE 1

Students in the Sample

| School Code | Teacher Code | Ethnicity of Students | | | | Sex | |
|---|---|---|---|---|---|---|---|
| | | Black[a] | Mexican-American | Anglo | Other Minorities | Male | Female |
| 1 | 9 | - | 31 | 42 | - | 32 | 46 |
| 1 | 14 | - | 22 | 42 | 11 | 31 | 44 |
| 1 | 19 | - | 32 | 31 | - | 31 | 38 |
| 2 | 11 | - | 52 | 14 | - | 43 | 36 |
| 3 | 15 | - | 20 | 51 | - | 35 | 37 |
| 3 | 17 | - | 36 | 41 | - | 44 | 33 |
| 3 | 18 | - | 28 | 40 | - | 30 | 40 |
| 3 | 21 | - | 29 | 40 | - | 42 | 33 |
| 4 | 1 | - | 35 | 45 | - | 50 | 30 |
| 4 | 2 | - | 48 | 25 | - | 40 | 34 |
| 4 | 4 | - | 33 | 41 | - | 36 | 40 |
| 4 | 10 | - | 33 | 40 | - | 41 | 33 |
| 5 | 22 | - | 34 | 28 | - | 24 | 49 |
| 6 | 12 | 59 | - | 19 | - | 40 | 38 |
| 7 | 3 | - | - | 69 | - | 39 | 40 |
| 7 | 13 | - | 12 | 61 | - | 36 | 41 |
| 7 | 16 | - | - | 68 | - | 42 | 35 |
| 8 | 5 | 19 | 35 | 12 | - | 37 | 33 |
| 8 | 6 | 35 | 34 | - | - | 35 | 38 |
| 8 | 8 | 27 | 32 | 19 | - | 35 | 42 |
| 8 | 20 | 17 | 47 | 11 | - | 35 | 38 |
| 9 | 7 | 11 | - | 47 | 14 | 37 | 41 |
| 9 | 23 | - | 13 | 41 | 13 | 36 | 39 |
| 9 | 24 | - | 14 | 58 | - | 44 | 35 |
| Totals | | 168 | 620 | 885 | 38 | 895 | 913 |

[a] Cells with fewer than ten students were not used in the analysis of engagement data because of the probability of sampling error.

## Data Gathering

Data were gathered by teams of trained observers using instruments constructed specifically for this study. One observer used the Teacher Strategy Instrument to record teacher behavior while a second used the Student Engagement Instrument to record student behavior. A third observer (calibrator) was present for specific periods to obtain interobserver reliability data. The observations were coordinated so that simultaneous recording of teacher and student behaviors in 10-second intervals was obtained.

Observations were organized into rounds. Two half-hour observations (Time 1 and Time 2) were made in each of the 24 classrooms during each round. In most instances, there was a 10- to 15-minute period between the end of Time 1 and the beginning of Time 2.

Five rounds of observations were made beginning with Round I in September 1971. Rounds II, III, IV, and V occurred in October 1971, November 1971, February 1972, and May 1972, respectively. Teachers were observed only while instructing in academic subjects during the rounds.

Videotape equipment was used to gather data during Round III, but because of the resulting disruptions in the behavior of students and teachers, it was decided not to use the Round III data in the analysis.

## Instrument Categories

Two instruments were developed for use in this study. The Teacher Strategy Instrument was designed after an extensive literature search and many consultations with and observations of teachers in the field. The Student Engagement Instrument was designed for recording specific behavioral indicators of engagement by students and also to give a global assessment of their behavior in relation to the teacher-prescribed task. Copies of both instruments are in Appendix B.

Category definitions for the instruments are given below:

### Teacher Strategy Instrument

1. Changes Activity (SVC:ACT)[1]
   Teacher changes student activity without changing the subject matter.

[1]Abbreviations are given for the headings on the instrument columns; strategy titles were revised slightly for clarity in reporting findings.

2. Changes Subject Matter (SVC:MAT)
   Teacher changes subject matter, e.g., math to language arts.

3. Surprises (SVC:S/N)
   Teacher does something unusual to arouse the curiosity and interest of the students, e.g., using poetry to illustrate a history lesson.

4. Encourages Manipulation of Materials (KMM)
   Teacher directs students to handle materials as part of the lesson, e.g., desk chalk boards or math rods for fractions.

5. Uses Visual Aids (TVS)
   Teacher uses visual stimuli to illustrate lesson, e.g., charts, film strips.

6. Moves (P:MOV)
   Teacher moves around the classroom.

7. Smiles (P:S/L)
   Teacher's facial expression shows pleasure and approval.

8. Touches (P:PHYS)
   Teacher touches child physically.

9. Commands (AM:I)
   Teacher uses grammatical imperatives to give commands.

10. Requests (AM:R)
    Teacher uses grammatical questions to direct student activities (observed in Rounds IV and V only).

11. Orients (O)
    Teacher relates new information or procedures to what the students have already done or explains what will be expected of them.

12. Summarizes (SUM)
    Teacher pulls together and re-states some aspect of the lesson, or repeats a student's answer.

13. States/Explains (S/E)
    Teacher describes, explains, reads, or answers a child's question in informative terms.

14. States/Explains Nonacademic (S/E:NA)
    Teacher explains general classroom procedures, announces meetings, etc.

15. Tests (CT)
    Teacher gives written tests to assess student's proficiency in specific subject matter.

16. Questions (CT:SQ)
    Teacher asks a question related to academic subject matter for which there is a specific answer.

17. Challenges (CT:CHAL)
    Teacher asks open-ended, nonspecific questions requiring reasoning or speculation on the part of the student.

18. Fosters Competition (COM)
    Teacher divides class into teams/groups and holds a race or competitive game for the purpose of learning a specific lesson.

19. Personalizes (P)
    Teacher gives individual student attention by either calling him by name or working with him in a one-to-one situation.

20. Personalizes Task (P:TASK)
    Teacher relates task to students' or her own personal experience.

21. Gives Feedback (F)
    Teacher gives information about the accuracy of a student response.

22. Anticipates Success (F:SUC)
    Teacher recognizes ability of either an individual or a group to succeed.

23. Recognizes Individual Achievement (F:RIA)
    Teacher indicates that an individual or a group has done well or more than expected.

24. Listens (P:LIST)
    Teacher attends to what the student is saying (observed in Rounds I and II only).

25. Shows Animation (GA:ANIM)
    Teacher shows more facial and upper body expressiveness than usual (observed in Rounds I and II only).

Categories on the Teacher Strategy Instrument were revised slightly after Round III. The categories Listens and Shows Animation were eliminated from the instrument, and States/Explains Nonacademic and Requests were added for Rounds IV and V.

The strategies were grouped into four broad categories or strategy classes for purposes of analysis: Stimulus Variation and Change, Affective, Task Structuring, and Evaluative.

Stimulus Variation and Change Strategies

Changes Activity
Changes Subject Matter
Surprises
Encourages Manipulation of Materials
Uses Visual Aids
Moves
Shows Animation

Affective Strategies

Personalizes
Smiles
Touches
Listens
Anticipates Success
Recognizes Individual Achievement

Task Structuring Strategies

Orients
States/Explains
Summarizes
Commands
Personalizes Task

Evaluative Strategies

Questions
Challenges
Gives Feedback
Tests
Fosters Competition

Student Engagement Instrument

1. Motor Engagement (MOTOR:E)
   Student movement in relation to task, e.g., writing, raising hand to recite, etc.

2. Motor Disengagement (MOTOR:D)
   Nontask-related student movement, e.g., fidgeting or striking peer.

3. Verbal Engagement (VERBAL:E)
   Student talking or singing in response to task assignment.

4. Verbal Disengagement (VERBAL:D)
   Student talking or singing inappropriately.

5. Visual Engagement (VISUAL:E)
   Student visually attending to appropriate task.

6. Visual Disengagement (VISUAL:D)
   Student not visually attending to appropriate task.

7. Global Engagement: Receptive (GLOBAL ASSESSMENT:R)
   Student looking at or listening to task or teacher but showing no motor or verbal engagement.

8. Global Engagement: Expressive (GLOBAL ASSESSMENT:E)
   Student looking at and engaging in task-related motor or verbal behavior.

9. Global Disengagement: Passive (GLOBAL ASSESSMENT:P)
   Student is neither attending to the task nor bothering another student or class.

10. Global Disengagement: Disruptive (GLOBAL ASSESSMENT:D)
    Student behaving in a manner disruptive to the learning process of one or more other students.

11. Direction: Nontask (DIRECTION:N)
    Student not attending to appropriate task.

12. Direction: Teacher (DIRECTION:T)
    Student attending to or interacting with teacher.

13. Direction: Aide (DIRECTION:A)
    Student attending to or interacting with teacher aide/ assistant.

14. Direction: Material (DIRECTION:M)
    Student working with materials related to task.

15. Direction: Peers (DIRECTION:P)
    Students working together on appropriate task without direct adult supervision.

16. Grouping: 2 (GROUPING:2)
    Student interacting with one other person; dyadic situations.

17. Grouping: Small (GROUPING:S)
    Student interacting in a group of three to eight students.

18. Grouping: Large (GROUPING:L)
    Student interacting in a group of nine or more students.

Categories 1 through 10 on the Student Engagement Instrument were also defined at either a moderate (1) or high (2) intensity level, and

observers recorded these levels on the instrument.

The category Direction:Aide was added to the Student Engagement Instrument after Round III.

Observer Training

Selection. Applicants for observer positions were recruited informally and by advertising through the Stanford Personnel Office. Eleven applicants who had expressed interest in the project were hired as observer trainees.

Initial training. The first training session was held for one week, six hours daily, at the end of August 1971. The first phase of the training program familiarized the trainees with the categories on the Teacher Strategy and Student Engagement Instruments. Trainees were required to memorize categories and definitions. Videotapes of natural classrooms were shown and the occurrences of teacher strategies and student engagement and disengagement were identified. Trainees then used videotapes of teachers to practice identifying and recording strategies. In addition, to train observers for student behaviors, a group of fifteen children was gathered to simulate a real class. While a research assistant taught a lesson to the children, the observers chose a sample of ten children and recorded their behaviors on the Student Engagement Instrument in 20-second intervals.

Observers were tested with videotape recordings on the last day of the training session and results showed acceptable levels of inter-observer agreement.

Retraining. Observers were retrained in February 1972. A training manual which included definitions and illustrations of categories on both instruments, a list of abbreviations of the categories, and samples of the revised instruments was compiled. Videotapes of observers role-playing behaviors from both instruments and videotapes of natural classrooms were again used as training aids. Observers were encouraged to practice independently with videotapes to improve weaknesses noted on diagnostic pretests given at the beginning of the retraining session.

Observation Procedures in the Classroom

At the beginning of each observation one observer set up the

recording equipment while the second observer selected the student sample. The equipment included a Sony cassette tape recorder with cassette tape, a stop watch, an audio-prompter, two sets of earphones, a Vega cordless microphone, and a Vega receiver. The audio-prompter was set to signal observation intervals and was connected to observer earphones and the recorder. During Rounds I and II, the interval time was 20 seconds; in Rounds IV and V it was 10 seconds to separate observing and recording by the observers. The observer tested the equipment and placed the microphone on the teacher. Setting up and checking the equipment required about 10 minutes.

The second observer chose a sample of ten students from the classroom. The sample was selected to reflect the proportion of boys to girls and the ethnic composition (Anglo, Black, Mexican-American, and other minorities) of the class. The observer used physical characteristics and sometimes student names in making judgments on ethnicity. The location of students in the classroom was also considered and an attempt was made to include different seating locations in the room in the sample. Time required for the selection procedure was about 15 minutes.

Observation routine. Two 30-minute observations (Time 1 and Time 2) were made on the same day. Time 1 observation began when equipment set-up and sample selection were complete. Observations were coordinated so that one observer watched the teacher while the second observer watched a student. At the signal from the audio-prompter, the observers recorded on the instruments what they had just seen. For the next interval, the student observer watched the second child in the student sample while the teacher observer continued to monitor teacher behavior. In succeeding intervals, the student observer recorded the behavior of each child in the sample in turn, following the order in which the children were selected. Thus, each child was observed every 200 seconds during the observation time.

The procedure of 10 seconds of observation followed by 10 seconds of recording continued for the remainder of the 30 minutes in Rounds IV and V. Observation and recording were done within one 20-second interval in Rounds I and II. Most of the observation times included 90 observation

intervals, although some were shortened by unforeseen circumstances in the classroom.

Following a 10- to 15-minute rest period, Time 2 observation began. The teacher observer from Time 1 chose a new student sample while the other observer focused on the teacher. The observation routine was then repeated.

After each teacher was observed in Rounds IV and V, the observers completed a Supplemental Observation Data Sheet, a set of questions designed to reflect any problems or unusual circumstances that might affect the validity of the behavior sample of students and teacher. A copy of the Data Sheet is in Appendix B.

Teacher-observer interactions. An important aspect of this study was the rapport between teachers and research staff. Although the design of the study rotated observers, teachers and observers did become acquainted during the five rounds. Most observations occurred in the mornings, and observers were usually at the school in time to have coffee and chat with the teacher before class began. The 10- to 15-minute breaks between Time 1 and Time 2 observations usually coincided with recess and again provided time for interaction. Although specific project-related topics were carefully avoided, observers and teachers did discuss such things as the general activity levels of the teacher's class and the physical facilities available. During the course of the project, most teachers and observers developed considerable rapport, which greatly facilitated the individual feedback sessions at the end of the year.

## Interobserver Agreement

Interobserver agreement data were obtained from a third observer (calibrator) who accompanied the two regular observers into the classroom. Calibrators were selected from the observer group on the basis of performance on training tasks and previous observation rounds.

Calibrations were obtained for 20-minute segments of selected 30-minute observation times. The calibrator and student observer rated student engagement behavior simultaneously for 10 minutes; the calibrator then rated teacher strategies with the teacher observer for 10 minutes.

The student engagement calibration was done first to allow the observer and calibrator to select student subjects before the observation began. Each observer was calibrated at least once, and seven of the eleven observers were calibrated two or more times.

Five sets of calibrations were obtained for the rounds as follows:

Round I: 4 Student Engagement Instrument observer calibrations
4 Teacher Strategy Instrument observer calibrations

Round II: 2 Student Engagement Instrument observer calibrations
3 Teacher Strategy Instrument observer calibrations

Round IV: 8 Student Engagement Instrument observer calibrations
8 Teacher Strategy Instrument observer calibrations

Round V: 4 Student Engagement Instrument observer calibrations
4 Teacher Strategy Instrument observer calibrations

The estimate of interobserver agreement used was the percentage of agreement to total observation instances for observers and calibrators. The agreement percentage was computed for each category on the Teacher Strategy and Student Engagement Instruments for each round. Data from all calibrations within a round were combined to obtain the percentage for that round. Mean percentages across the four rounds were also computed for each category on both instruments. Agreement percentages for the Teacher Strategy Instrument categories are shown in Table C-1 in Appendix C; percentages for the Student Engagement Instrument categories are in Table C-2 in Appendix C.

Figure 2 shows the average percentage of agreement over rounds for the Teacher Strategy Instrument and Figure 3 shows the average percentage of agreement over rounds for the Student Engagement Instrument.

The criterion level for acceptable interobserver agreement was set at 70 percent for all categories on both instruments. Of the 23 categories on the Teacher Strategy Instrument, 19 were above criterion for Round I, 21 for Round II, and all 23 were above 70 percent in Rounds IV and V.

Percentage of agreement figures were computed for each strategy class on the Teacher Strategy Instrument. The Stimulus Variation and Change class showed an all-rounds mean of 95 percent; the Affective class mean was 88 percent; the Task Structuring class mean was 89 percent; and

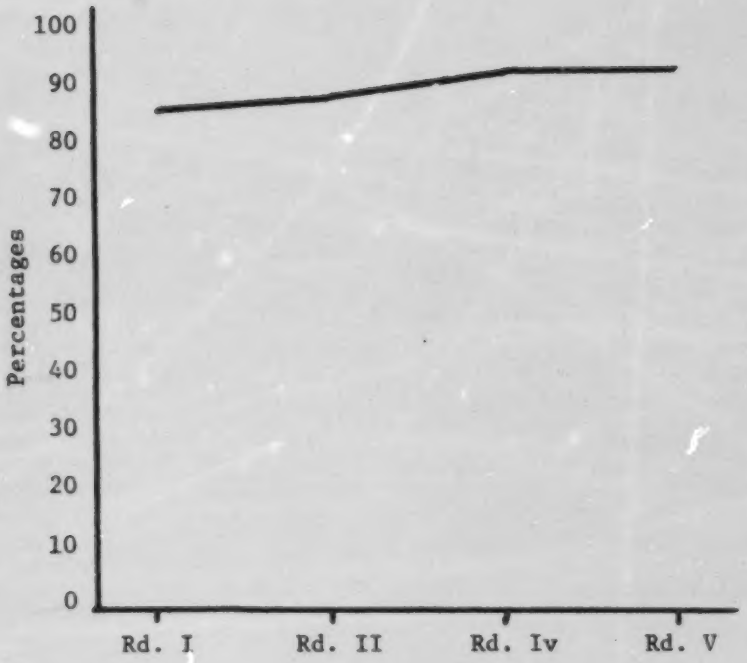


Fig. 2. Percentage of agreement over rounds for 23 categories on the Teacher Strategy Instrument.

the Evaluative class mean was 88 percent. Percentages for each class for each round are in Table C-1 in Appendix C.

The agreement percentages for the Student Engagement Instrument categories for Rounds I, IV, and V were all above criterion. In Round II, 13 of the 17 categories showed percentages at or above criterion.

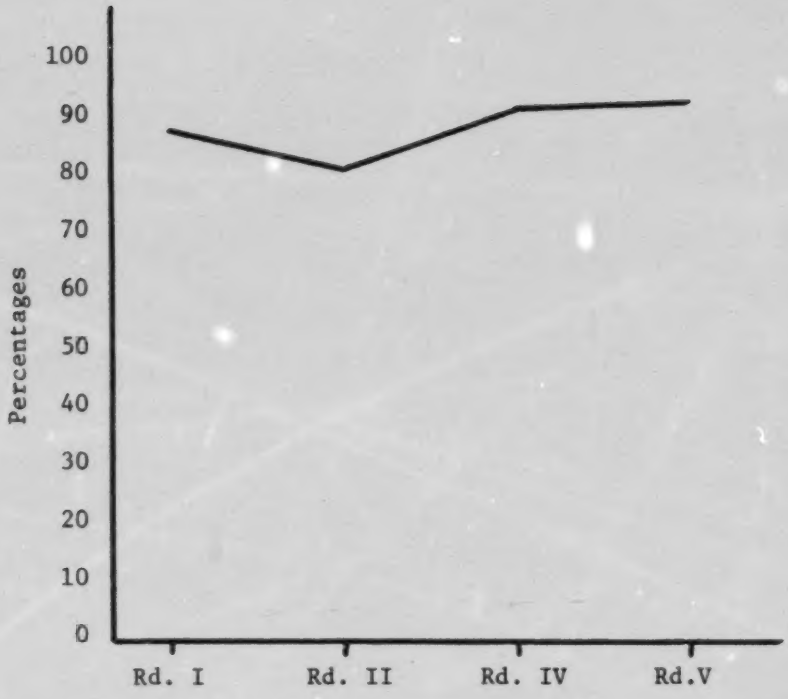


Fig. 3. Percentage of agreement over rounds for 18 categories on the Student Engagement Instrument.

Interobserver agreement percentages for the two global engagement categories (Receptive and Expressive) combined were 94, 94, 92, and 97 for Rounds I through V respectively. Percentages for the two global disengagement categories (Passive and Disruptive) were 94, 94, 93, and 97 for Rounds I through V respectively.

Several qualifications should be placed on the interpretation of these agreement percentages. The figures are overestimates to the extent that they are uncorrected for chance agreement between observers and calibrators. In addition, the percentages do not represent intensity of

engagement measures recorded on the Student Engagement Instrument. Finally, a number of categories on both instruments had very low frequencies of ratings and this may have increased the percentages for these categories to some degree. For example, if a strategy occurred only once in 30 intervals and both the calibrator and observer recorded it, the percentage agreement would be 100; if either one failed to record it, the agreement would still be 97 percent since there would be 29 intervals in which the observer and calibrator agreed that the strategy did not occur. The average frequency of ratings per calibrated instrument for both calibrators and observers is given in Tables C-3 and C-4 in Appendix C.

Interobserver agreement improved noticeably between Rounds II and IV. Several factors may account for this increase: modification of equipment, procedural changes in observation techniques, calibrator changes, intensive observer retraining, and category definition revision.

The observation procedure within the intervals was changed for Round IV. Observers were instructed to observe for 10 seconds and then to record for 10 seconds instead of recording each behavior as it occurred within the full 20-second interval. The audio-prompter was adjusted to signal every 10 seconds. These changes were made to ensure, insofar as possible, that observers and calibrators observed and recorded the same behaviors and that teacher observers and student observers observed and recorded for identical intervals. Before the interval time was shortened, it was possible for one observer to be watching while the other was recording; thus simultaneous observation was not always achieved.

The number of calibrators was limited to one for the last two rounds of observation (IV and V). Two calibrators were used in Round I and three in Round II. The use of a relatively constant standard for agreement data in Rounds IV and V may have contributed to the increases in the number of agreements in those rounds.

At the end of Round II, efforts were made to improve interobserver agreement by retraining observers and by redefining some of the categories. Observer training videotapes were produced and training sessions were arranged to bring all observers to the criterion level for agreement

(70 percent). The Observer Training section of this report describes the complete retraining procedures.

In general, interobserver agreement on all categories over the four rounds of observation appeared to be high enough to merit confidence in the quality of the observational data and to support conclusions drawn from the data.

## Results

### Analysis of Student Engagement

The indicator of level of student engagement was the percentage of instances of student engagement of the total number of student observation intervals. The level of student engagement in the sample classrooms ranged among observation rounds from a mean of 75.1 percent (Round I) to a mean of 83.4 percent (Round V). Most of the children in the classrooms were engaged during the observation times (Figure 4). As the school year progressed, there was a decrease in the range of student engagement percentages and a tendency for the mean percentage over all teachers to increase (Figure 4).

Because the assumption was made that some teachers would be much more successful than others in engaging students, an analysis of differences among teachers was obviously important. The results on this point were not conclusive nor were they adequate to answer the question about teacher differences. Observers reported that there were large teacher-to-teacher differences; the top quartile teachers as a group have mean levels of engagement consistently higher than do the bottom quartile teachers (Figure 5); and the means among teachers over all rounds (Table 2) appear to differentiate clearly among teachers. The round-to-round variation for individual teachers, however, obscured the across-round differences, yielding an analysis of variance result which was not significant (Table 3). While the analysis does not support conclusions at this point, both the intrateacher and interteacher variations are striking.[2]

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[2]Two-way ANOVA and Scheffe's multiple comparisons test were used to help determine whether there were differences in the percentage of students engaged among teachers and rounds. Table 2 presents the data used in the tests of significance. Arcsin transformations of the percentages were used in the ANOVA to meet the assumptions of the test.

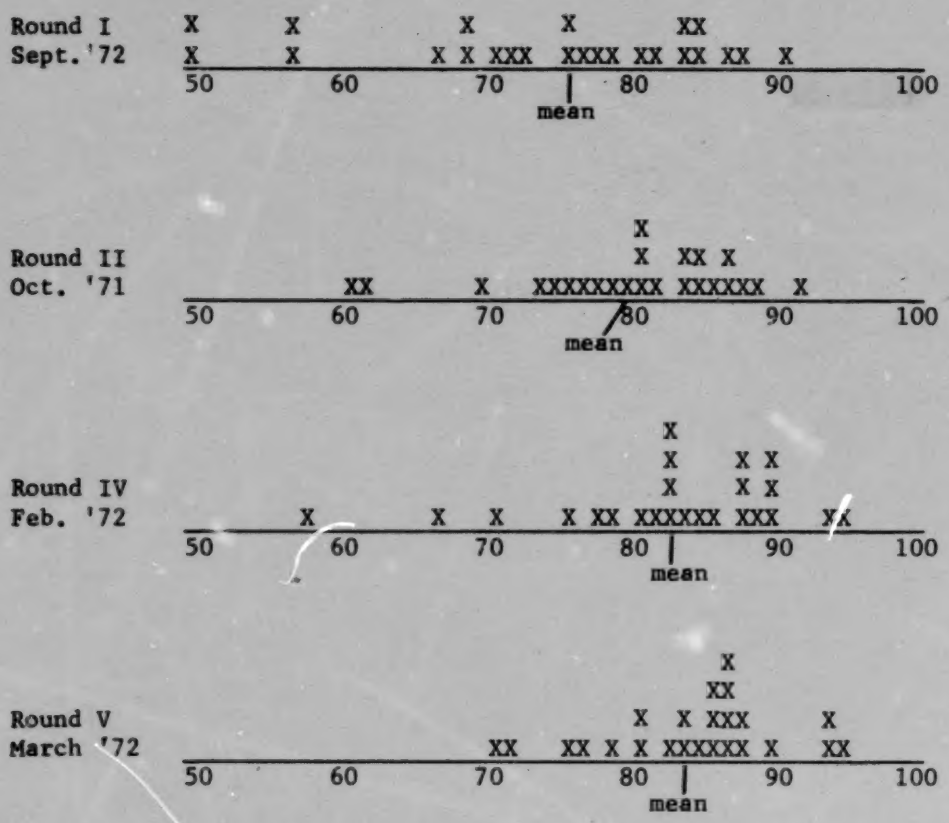


Fig. 4. Distribution of percentages of student global ratings engaged (24 teachers in four rounds).

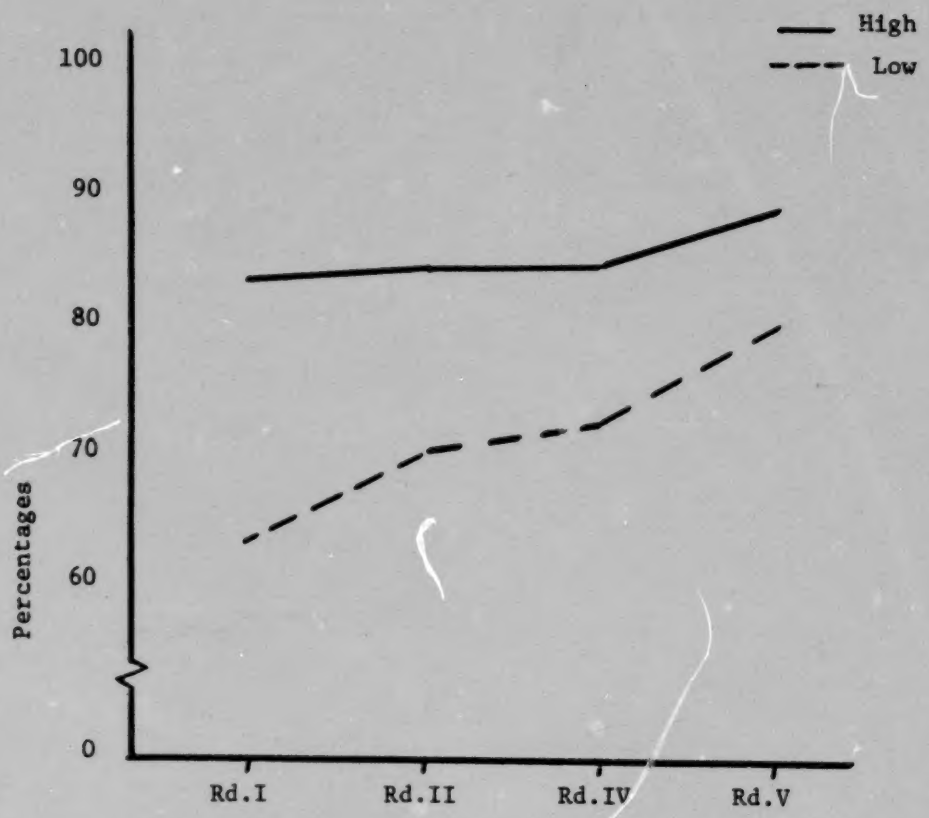


Fig. 5. Mean percentage of engagement for high- and low-engaging teachers.

TABLE 2

Percentage of Student Global Ratings Engaged, by Teacher and Round

| Teacher Code | Round I | Round II | Round IV | Round V | All Rounds |
|---|---|---|---|---|---|
| 1 | 71.1 | 87.8 | 92.7 | 89.4 | 85.2 |
| 2 | 74.9 | 79.5 | 93.9 | 85.7 | 83.8 |
| 3 | 71.7 | 90.6 | 85.1 | 86.6 | 83.4 |
| 4 | 75.3 | 84.1 | 88.8 | 75.7 | 80.9 |
| 5 | 81.1 | 73.7 | 75.4 | 78.3 | 77.4 |
| 6 | 57.2 | 62.7 | 66.4 | 85.6 | 68.5 |
| 7 | 77.2 | 80.2 | 80.3 | 94.4 | 82.8 |
| 8 | 83.7 | 60.1 | 57.9 | 81.7 | 71.4 |
| 9 | 78.7 | 83.1 | 82.1 | 84.2 | 82.0 |
| 10 | 85.8 | 80.0 | 86.5 | 85.2 | 84.2 |
| 11 | 84.0 | 85.9 | 80.9 | 86.7 | 84.4 |
| 12 | 82.7 | 75.4 | 82.4 | 79.7 | 80.0 |
| 13 | 83.3 | 79.3 | 82.0 | 93.0 | 84.4 |
| 14 | 89.7 | 86.0 | 84.1 | 83.0 | 85.6 |
| 15 | 68.7 | 69.3 | 81.5 | 80.4 | 75.1 |
| 16 | 86.7 | 82.7 | 78.4 | 92.7 | 85.2 |
| 17 | 76.4 | 72.6 | 77.1 | 71.1 | 74.2 |
| 18 | 79.7 | 77.0 | 87.1 | 84.8 | 81.8 |
| 19 | 66.9 | 81.3 | 86.7 | 86.7 | 81.3 |
| 20 | 57.1 | 84.7 | 83.1 | 74.9 | 74.9 |
| 21 | 69.3 | 86.5 | 88.8 | 70.3 | 79.1 |
| 22 | 77.8 | 76.1 | 88.5 | 84.6 | 81.5 |
| 23 | 49.2 | 78.1 | 70.0 | 83.3 | 69.6 |
| 24 | 72.8 | 84.4 | 88.4 | 85.6 | 82.9 |
| All | 75.1 | 79.4 | 82.1 | 83.4 | 80.0 |

TABLE 3

Summary of a Two-Way ANOVA for
Percentage of Student Global Ratings Engaged,
for All Teachers and Four Observation Rounds

| Source | Sum of squares | Degrees of freedom | Mean squares | F ratio |
|---|---|---|---|---|
| Teachers | 1.27 | 23 | .0552 | 1.56 |
| Rounds | .41 | 3 | .1366 | 3.85* |
| Teachers x Rounds | 2.45 | 69 | .0355 | |
| Total | 4.13 | | | |

*p < .05

Significant differences (Scheffe's test) in the percentage of students were found between Round I and Round IV ($p < .05$) and between Round I and Round V ($p < .01$).

In summary, the sample classrooms were characterized by fairly high levels of engagement, although there were teacher differences in the percentage of students engaged in each classroom. In the next stage of the analysis the focus was on sources of variation in student engagement levels. Engagement of students of different sex and ethnicity and those involved in different instructional groups and subject matter were explored.

Sex differences. A commonly held assumption is that children of different sexes behave differently in the classroom. Boys are perceived by teachers as being more difficult to control and more physically aggressive than girls. Boys generally have poorer relationships with their teachers than girls (Lippitt and Gold, 1959; Schmuck and Van Egmond, 1965). In the observational data, however, although there was a tendency for females to be more engaged than males, no significant differences (sign test) in student engagement by sex were found (Table 4). These findings are especially intriguing when related to studies which

TABLE 4

Percentage of Male and Female Student Global Ratings Engaged, by Teacher (Four Observation Rounds)

| Teacher Code | Males | Females |
|---|---|---|
| 1 | 85.5 | 84.8 |
| 2 | 84.1 | 83.6 |
| 3 | 79.6 | 87.1 |
| 4 | 76.9 | 84.5 |
| 5 | 76.1 | 79.0 |
| 6 | 69.5 | 67.6 |
| 7 | 83.3 | 82.3 |
| 8 | 64.7 | 76.9 |
| 9 | 77.3 | 85.2 |
| 10 | 80.8 | 88.5 |
| 11 | 83.7 | 85.3 |
| 12 | 76.8 | 83.3 |
| 13 | 87.0 | 82.1 |
| 14 | 84.8 | 86.2 |
| 15 | 73.6 | 76.6 |
| 16 | 81.6 | 89.5 |
| 17 | 73.1 | 75.5 |
| 18 | 81.0 | 82.4 |
| 19 | 85.7 | 77.7 |
| 20 | 71.3 | 78.2 |
| 21 | 76.2 | 82.9 |
| 22 | 78.1 | 83.2 |
| 23 | 71.9 | 67.3 |
| 24 | 81.7 | 84.3 |
| All | 78.6 | 81.4 |
| N(instances) | 7962 | 8124 |

indicate that boys are significantly more likely to be contacted by the teacher for misconduct (Jackson and Lahaderne, 1967).

Ethnic group differences. Although the focus of the study was upon engagement of students in low-income areas of school districts, several different ethnic groups were represented in the research population.

Any marked differences in pattern of engagement or in the types of teacher strategies more effective with one group than another would be not only of descriptive interest but would have obvious relevance for teacher training and selection. The analysis of ethnic differences was intended to provide such basic information about teacher and student behavior in the classroom.

In the data, no significant differences among ethnic groups in level of engagement appeared (Table 5). The total student research group included approximately 885 Anglo students, 620 Mexican-American students,

TABLE 5

Percentage of Student Global Ratings Engaged, by Teacher by Ethnic Group (Four Observation Rounds)

| Teacher | Black | Mexican-American | Anglo | Other |
|---|---|---|---|---|
| 1 | -- | 85.7 | 84.9 | -- |
| 2 | -- | 82.9 | 85.7 | -- |
| 3 | -- | -- | 82.5 | -- |
| 4 | -- | 75.8 | 85.4 | -- |
| 5 | 76.2 | 75.1 | 80.6 | -- |
| 6 | 64.2 | 72.0 | -- | -- |
| 7 | 78.1 | -- | 83.3 | 86.7 |
| 8 | 74.9 | 69.2 | 70.1 | -- |
| 9 | -- | 82.3 | 80.9 | -- |
| 10 | -- | 84.3 | 84.4 | -- |
| 11 | -- | 84.4 | 82.3 | -- |
| 12 | 80.8 | -- | 77.2 | -- |
| 13 | -- | 86.7 | 84.2 | -- |
| 14 | -- | 80.0 | 86.5 | 92.6 |
| 15 | -- | 77.5 | 74.1 | -- |
| 16 | -- | -- | 85.5 | -- |
| 17 | -- | 74.1 | 74.2 | -- |
| 18 | -- | 81.9 | 82.7 | -- |
| 19 | -- | 76.8 | 86.4 | -- |
| 20 | 67.8 | 77.4 | 74.7 | -- |
| 21 | -- | 75.8 | 80.8 | -- |
| 22 | -- | 80.1 | 82.3 | -- |
| 23 | -- | 76.9 | 66.2 | 78.0 |
| 24 | -- | 84.9 | 82.6 | -- |
| All | 80.8 | 73.7 | 79.2 | 85.8 |
| N (instances) | 1478 | 5509 | 7870 | 324 |

168 Black students, and 38 students from other minority backgrounds. Only one class in the group studied was not predominantly Anglo. This sort of distribution in and among classrooms may problematic any result on ethnic differences. The findings, however, lead to the conclusion that at the third and fourth grade levels there are no marked ethnic differences in levels of engagement in low-income classrooms. If ethnic differences appear among communities or areas of large metroplitan regions, as is sometimes suggested in literature on urban education, they may be created and maintained by social, economic, and other conditions and not directly related to ethnic tendencies. At this point, there is no reason to reject the hypothesis of no difference in engagement between ethnic groups.

Instructional group size. Field and laboratory research on group size and individual participation and involvement suggests that student engagement will increase in small instructional groups (Willems, 1964). As expected, significant differences in student engagement were found between small and large groups ($p < .05$) and between dyadic and large groups ($p < .05$) when sign tests were used. No differences were found between dyadic and small group engagement (Table 6). These results suggest that as the number of students in the instructional group increases, the percentage of students engaged tends to decrease.

Different subject matter areas. Finally, student engagement in different subject matter areas was examined. Three subject matter areas were included in the observations--language arts, reading, and mathematics. Subject matter was not sampled systematically, however, and not all teachers were observed in each subject matter. There were no significant differences in student engagement in the three subject matter areas when sign tests were used (Table 7).

## Analysis of Teacher Strategies

The first step toward discovering whether a link could be made between student engagement and teacher strategies was to examine teacher strategy use in the sample. Observation data were analyzed to determine frequency of strategy use, differences in frequencies between strategies,

TABLE 6

Percentage of Student Global Ratings Engaged, by Teacher by Group Size (Four Observation Rounds)

| Teacher | Dyadic | Small* | Large* |
|---|---|---|---|
| 1 | 94.7 | 94.7 | 82.1 |
| 2 | 92.1 | 86.8 | 82.3 |
| 3 | 86.7 | 90.7 | 82.0 |
| 4 | 93.3 | 93.1 | 77.7 |
| 5 | 100.0 | 100.0 | 76.7 |
| 6 | 96.2 | 74.5 | 64.3 |
| 7 | 81.3 | 74.4 | 83.3 |
| 8 | 60.0 | 80.0 | 68.5 |
| 9 | 84.6 | 87.2 | 77.4 |
| 10 | 71.4 | 91.0 | 83.2 |
| 11 | 95.0 | 82.3 | 84.7 |
| 12 | 95.0 | 100.0 | 77.9 |
| 13 | 100.0 | 88.7 | 81.5 |
| 14 | 96.2 | 95.0 | 79.2 |
| 15 | 100.0 | -- | 74.9 |
| 16 | 96.4 | 89.5 | 83.3 |
| 17 | 83.3 | 81.0 | 73.4 |
| 18 | 100.0 | 100.0 | 81.7 |
| 19 | 93.0 | 85.2 | 78.4 |
| 20 | 88.9 | 87.5 | 74.4 |
| 21 | 100.0 | -- | 78.4 |
| 22 | 90.0 | 94.6 | 77.5 |
| 23 | 90.4 | 92.9 | 66.0 |
| 24 | 92.0 | 80.0 | 82.1 |
| All | 90.9 | 84.7 | 77.9 |
| N (instances) | 661 | 2129 | 9990 |

*Sign test differences between small and large, dyadic and large, $p < .05$.

TABLE 7

Percentage of Student Global Ratings Engaged, by Teacher by Subject Matter (Four Observation Rounds)

| Teacher | Language Arts | Reading | Math |
|---|---|---|---|
| 1 | 82.2 | — | 91.6 |
| 2 | 81.1 | — | 87.6 |
| 3 | 79.7 | — | — |
| 4 | 68.9 | 89.9 | 77.6 |
| 5 | 77.7 | — | 77.2 |
| 6 | — | — | 64.1 |
| 7 | 83.4 | 82.2 | — |
| 8 | 66.7 | — | 75.8 |
| 9 | — | 92.5 | 75.6 |
| 10 | 85.6 | 90.3 | — |
| 11 | — | 81.8 | 87.1 |
| 12 | 87.1 | 73.3 | — |
| 13 | 84.9 | 88.8 | 78.6 |
| 14 | — | 94.5 | 78.1 |
| 15 | 68.2 | — | 83.4 |
| 16 | 80.8 | 88.8 | — |
| 17 | 77.9 | — | 70.7 |
| 18 | 73.0 | — | 91.0 |
| 19 | 82.9 | — | 81.8 |
| 20 | 85.1 | 66.9 | 62.7 |
| 21 | 76.2 | — | 82.1 |
| 22 | 76.6 | 83.5 | — |
| 23 | 68.6 | 72.2 | — |
| 24 | 87.6 | 85.3 | 77.2 |
| All | 78.1 | 83.9 | 79.0 |
| N (instances) | 6325 | 3003 | 5129 |

and frequency differences in the use of several classes of strategies. Individual differences in strategy use among teachers, consistency, and the relationship between grouping and strategy use were also examined.

Frequency of strategy use. The sample teachers used a total of 54,146 strategies in 16,687 observation intervals. Thus there was an

average of three strategies per observation interval. Because the number of observation intervals varied slightly among teachers for different observation times, strategy use was calculated on a percentage basis for all teachers combined and for each individual teacher.

Table 8 gives the percentage of time each strategy was used by the 24 teachers and also the range of percentages for each strategy among teachers. Frequently occurring strategies were: Personalizes (53%), States/Explains (45%), Moves (36%), and Listens (35% in Rounds I and II only). Infrequently occurring strategies were: Surprises (0.2%), Changes Subject Matter (0.4%), Anticipates Success (1%), Fosters Competition (2%), and Changes Activity (2%).

For purposes of this analysis the States/Explains and States/Explains Nonacademic categories were considered as one category (States/Explains), and the Commands and Requests categories were combined (Commands).

The strategies were grouped into four broad categories or strategy classes for purposes of analysis: Stimulus Variation and Change, Affective, Task Structuring, and Evaluative. (See Instrument Categories.)

The rationale for this grouping of strategies was that there might be differences in high- and low-engaging teachers in their use of various kinds of techniques. It seems possible that teachers high in Affective Strategies and in Stimulus Variation and Change Strategies might engage more of the students in their classes. Also, it seemed possible that there would be shifts during the year in the use of different strategies. In fact, the Task Structuring Strategies showed a mean use decrease of 11 percent between fall and spring and the Affective Strategies showed a mean increase of 5 percent. These changes may reflect the teacher's attempts to set a pace and establish a classroom climate in the fall and her increased perception of student individuality in the spring.

The conception of engagement was that it included transitory responses to specific, immediately apparent stimuli, longer term commitment to pursuit of tasks (as in work contracts between teacher and student), and relationships between students and teachers that might encompass more affective processes such as modeling, identification, and attachment.

TABLE 8

Percentages and Ranges of Strategy Use for All Teachers
(Four Observation Rounds)

| Strategy | Percentages for all Teachers | Lowest Percentage | Highest Percentage |
|---|---|---|---|
| Stimulus Variation and Change | | | |
| Changes Activity | 2 | 1 | 5 |
| Changes Subject Matter | .4 | 0 | 2 |
| Surprises | .2 | 0 | 3 |
| Encourages Manipulation of Materials | 8 | 0 | 19 |
| Uses Visual Aids | 21 | 7 | 37 |
| Moves | 36 | 17 | 55 |
| Shows Animation | 15 | 2 | 37 |
| Affective | | | |
| Personalizes | 53 | 30 | 90 |
| Smiles | 17 | 4 | 35 |
| Touches | 4 | 1 | 8 |
| Listens | 35 | 6 | 68 |
| Anticipates Success | 1 | 0 | 3 |
| Recognizes Individual Achievement | 6 | 1 | 14 |
| Task Structuring | | | |
| Orients | 3 | 1 | 8 |
| States/Explains | 45 | 34 | 54 |
| Summarizes | 6 | 2 | 9 |
| Commands | 21 | 11 | 45 |
| Personalizes Task | 5 | 0 | 16 |
| Evaluative | | | |
| Questions | 31 | 21 | 53 |
| Challenges | 6 | 2 | 13 |
| Gives Feedback | 27 | 14 | 38 |
| Tests | 3 | 0 | 18 |
| Fosters Competition | 2 | 0 | 8 |

The data did not permit an examination of the more complex aspects of student engagement, but the analysis of these groups of strategies was begun in order to explore the potential value of this type of inquiry.

When the total number of strategies used was divided into the four strategy classes, 30 percent of the strategies used were Affective, 25 percent were Task Structuring, 23 percent were Stimulus Variation and Change, and 22 percent were Evaluative.

Teacher differences in strategy use. There were differences among teachers in the total number of strategies used as well as in the percentages of different strategies used. For example, Teacher 1 used 595 more strategies across the four rounds than Teacher 16 did. When the number of strategies used per 5 minutes of instruction was computed for each teacher during each observation time, the number varied from 22 to 69 for two different teachers during Round II, Time 1. The means for each teacher across observation times did not show such dramatic differences, however; the highest mean was 54 (Teacher 15) and the lowest was 37 (Teacher 23). Thus the number of strategies a teacher used varied among teachers and also for each teacher. There seems to be little connection, however, between the number of strategies used and the engagement levels of classes (see Patterns of Strategy Use During Times of High Engagement).

Individual differences in the percentage of use of specific strategies were found among teachers. The largest differences occurred in the most frequently used strategies, e.g., Personalizes, which one teacher used 90 percent of the time and another used only 30 percent of the time during observation. Figure 6 shows the mean percentages and ranges of strategy use by teachers.

Teacher strategy use profiles were constructed for each teacher to show the percentage of time each of the strategies was used. A full set of these profiles can be found in Appendix D. Strategy class profiles are included here to show differences in usage among teachers. Teacher 1, for example, used more Stimulus Variation and Change Strategies than any of the other teachers; Teacher 7 used the fewest. These differences are shown in Figure 7.

Teacher 1 also used more Affective Strategies than any other

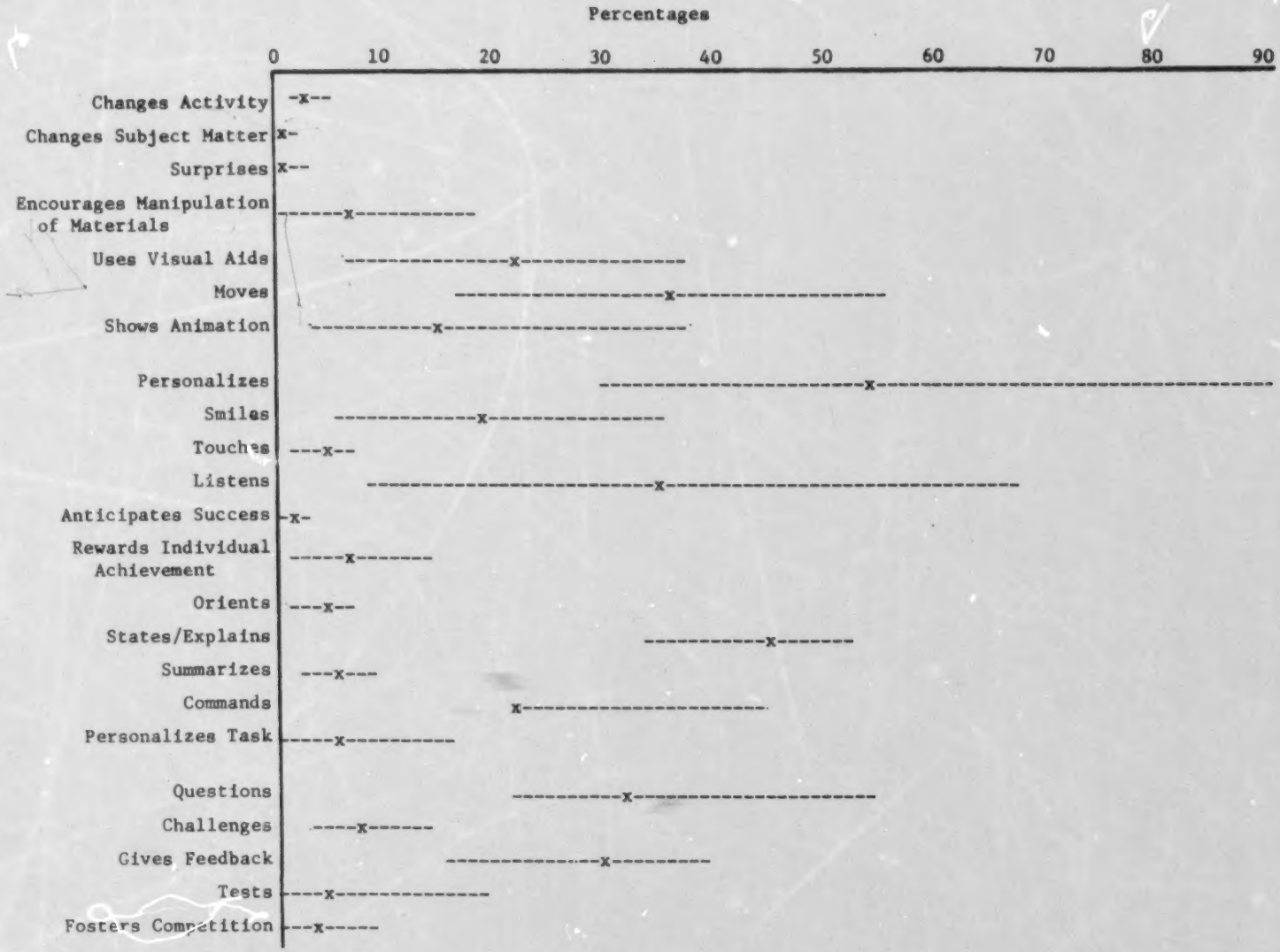


Fig. 6. Range and mean percentage of use for each teacher strategy (all teachers combined).

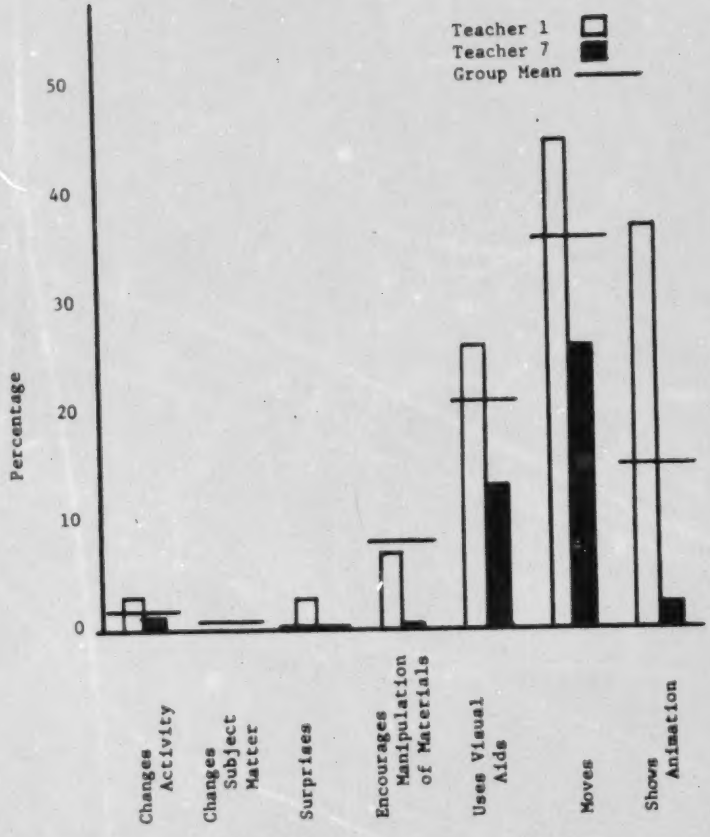


Fig. 7. Percentage of Stimulus Variation and Change class strategy use for teachers 1 and 7 and group means for each strategy.

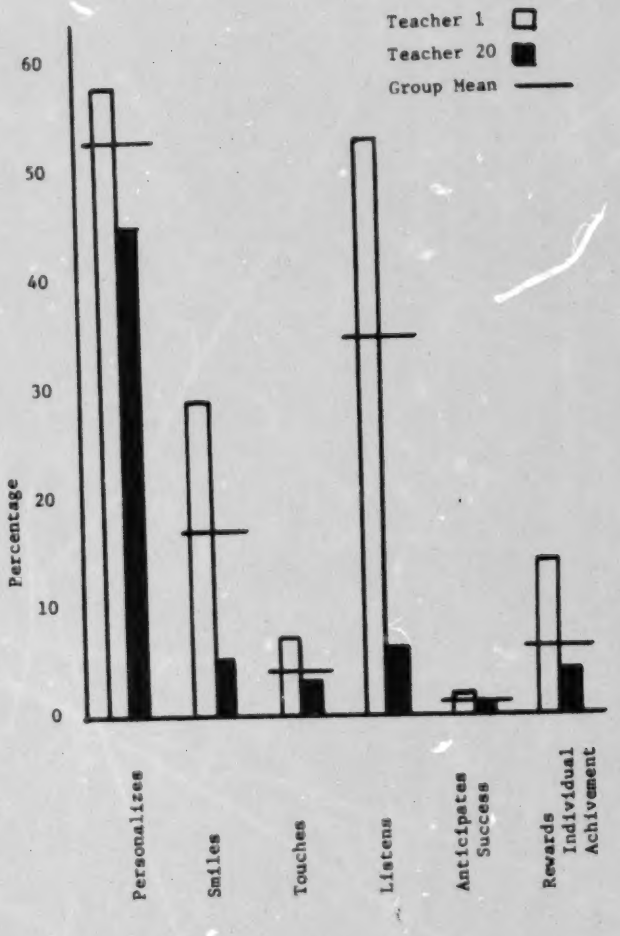


Fig. 8. Percentage of Affective class strategy use for teachers 1 and 20 and group means for each strategy.

teacher; Teacher 20 used the fewest (Figure 8). Teacher 6 used more Task Structuring Strategies than any other teacher, and Teacher 14 used the fewest (Figure 9). Teacher 14 used the most Evaluative Strategies, and Teacher 8 used the fewest (Figure 10).

There are obvious differences in the percentage of use of the strategy classes and individual strategies among teachers. It is difficult to integrate these differences into a definite pattern of teaching styles, however, because there is so much variation within the group of sample teachers.

Consistency of strategy use. The image of the successful low-income area teacher using highly engaging strategies is contingent on the assumption that there is some consistency in the teacher's strategy use. Testing this assumption thus became an item of some importance in the analysis of strategy data.

Teacher consistency in strategy use can be viewed in different ways, depending on which data are used. Examination of strategy frequencies relative to other strategies during different observation times shows that teachers tended to use some strategies more than others each time they were observed. Across all teachers, Personalizes, States/Explains, and Listens consistently occurred more frequently than Changes Activity, Changes Subject Matter, or Anticipates Success (Table 8). On an individual basis, Teacher 18 used Personalizes more than any other strategy during each of the four observation rounds. In this sense, there is consistency.

Another way to analyze consistency is to examine the raw frequencies of individual strategy use from observation time to observation time. Teacher 18 used Personalizes 106 times in Round I and only 84 times in Round IV; Teacher 10 used Personalizes 121 times in Round II and only 57 times in Round IV, and again it was her most-used strategy each time. These differences are impressive. Thus, when this approach is taken, teachers showed a great deal of variation in strategy use from time to time.

A third approach is to cluster strategies (both high use and low use) into broad categories or classes and then to rank order teachers on

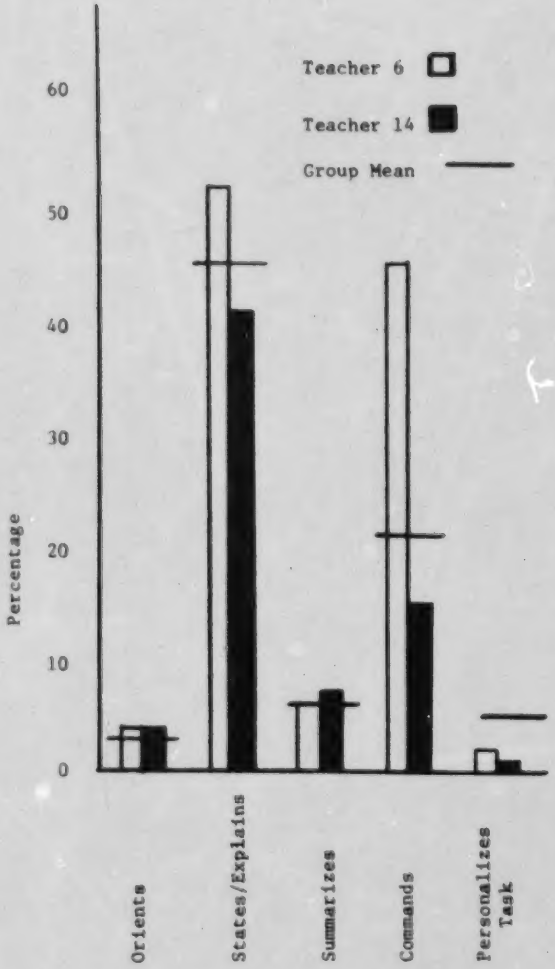


Fig. 9. Percentage of Task Structuring class strategy use for teachers 6 and 14 and group means for each strategy.

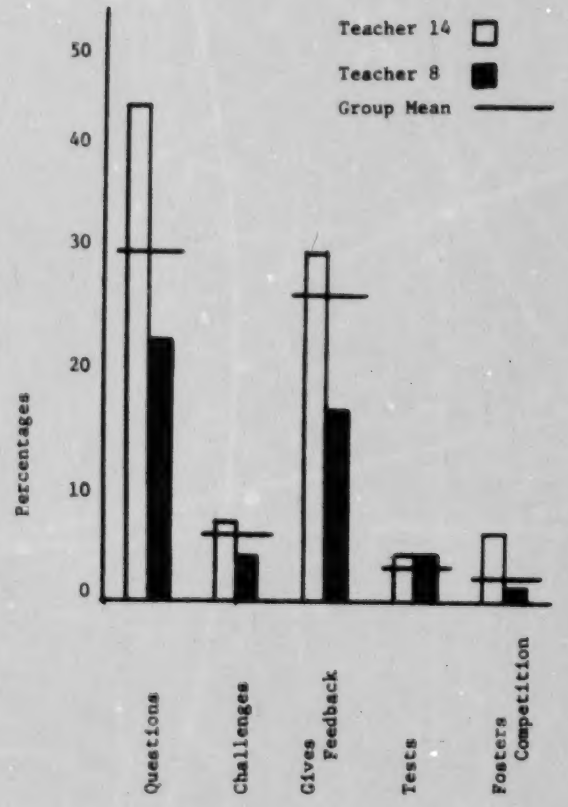


Fig. 10. Percentage of Evaluative class strategy use for teachers 14 and 8 and group means for each strategy.

their use of a strategy class during a particular observation time. This procedure was followed for the observation times in Rounds IV and V, and rank order correlations (Spearman) were performed. Table 9 shows the correlations; only 7 of the 24 were significant. Again, it appears that the teachers were not very consistent in their use of classes of strategies.

TABLE 9

Spearman Rank Order Correlations for Percentages of Strategy Class Use by 24 Teachers and Observation Times in Rounds IV and V

| Strategy Class | Observation Times | | | | | |
|---|---|---|---|---|---|---|
| | IV:1-IV:2 | IV:1-V:1 | IV:1-V:2 | IV:2-V:1 | IV:2-V:2 | V:1-V:2 |
| Stimulus Variation and Change | .06 | .35* | .16 | -.06 | .64** | -.07 |
| Affective | .41* | .41* | .20 | .22 | .37* | -.04 |
| Task Structuring | .12 | .26 | .24 | -.13 | .33 | .34* |
| Evaluative | -.03 | .43* | .23 | .24 | .20 | -.03 |

**p < .01
*p < .05

The assumption of teacher consistency is thus open to question in these data. It is possible, of course, that contextual factors may affect patterns of strategy use. Teachers may adapt to situational variables, e.g., instructional group size or subject matter, in ways that are, in fact, "consistent." The second phase of the study was designed to permit examination of the effect of some contextual variables on consistency of strategy use.

Situational effects upon strategy use. One of the basic empirical questions about teacher instructional strategies is whether they follow a teacher's individual style (thus being presumably somewhat resistant to

change) or are responses to situational and/or teacher-arranged conditions. This question is related to other issues such as the efficacy of inservice versus preservice training to modify teacher strategy use and the relative importance of teacher selection versus teacher training. If teachers can modify or be helped to modify their own patterns of strategy use, feedback on the techniques they use and the observed effects of different techniques on the engagement of students in their classes might be useful. One indirect approach to an examination of this general issue is the analysis of relationships between size of instructional group and patterns of strategy use. If a given teacher within a relatively short period of time changes her strategy in response to student group size, it would appear that her own style is clearly subject to situational influence. If there is a consistent shift or difference in strategy use in relation to size of instructional group, this supports even more strongly the idea that strategies are responses to an instructional environment rather than assertions of the teacher's individual style.

In the analysis of the data relevant to this point, a subset of strategy frequencies was used: only those strategies that occurred when students were teacher-directed were included. Because the instances of dyadic grouping were relatively infrequent, dyadic and small groups were combined for analysis. The analysis thus considered percentage of use of the four strategy classes in two grouping conditions: large and dyadic-small. Table 10 shows the percentages.

Sign tests on the data showed significant differences in percentage of use of both Stimulus Variation and Change Strategies and Affective Strategies between large and dyadic-small groups ($p < .05$). Teachers used more Affective Strategies in dyadic-small groups and more Stimulus Variation and Change Strategies in large groups. No differences were found in the use of Task Structuring or Evaluative Strategy classes for the different sized groups.

Impact of Teacher Strategies on Student Engagement

The attempt to demonstrate that predictable relationships exist

TABLE 10

Strategy Class Use in Large and Dyadic-Small Groupings
(Four Observation Rounds, Percentage of Time)

| Teacher Code | Affective Strategies | | Stimulus Variation and Change Strategies | | Task Structuring Strategies | | Evaluative Strategies | |
|---|---|---|---|---|---|---|---|---|
| | Large | Dyadic Small | Large | Dyadic Small | Large | Dyadic Small | Large | Dyadic Small |
| 1 | 38% | 38% | 27% | 19% | 21% | 20% | 14% | 23% |
| 2 | 36 | 28 | 16 | 20 | 23 | 26 | 26 | 26 |
| 3 | 19 | 28 | 37 | 23 | 25 | 33 | 19 | 15 |
| 4 | 28 | 34 | 25 | 7 | 20 | 24 | 28 | 36 |
| 5 | 18 | -- | 17 | -- | 42 | -- | 24 | -- |
| 6 | 12 | 19 | 32 | 18 | 41 | 39 | 15 | 24 |
| 7 | 29 | 27 | 23 | 4 | 26 | 45 | 22 | 25 |
| 8 | 26 | 24 | 30 | 21 | 23 | 25 | 21 | 30 |
| 9 | 35 | 27 | 21 | 22 | 30 | 26 | 14 | 25 |
| 10 | -- | 44 | 28 | 7 | 26 | 26 | 18 | 22 |
| 11 | 38 | 40 | 17 | 9 | 20 | 18 | 25 | 35 |
| 12 | 24 | 35 | 19 | 16 | 29 | 27 | 27 | 22 |
| 13 | 26 | 36 | 24 | 11 | 30 | 21 | 20 | 32 |
| 14 | 32 | 31 | 24 | 25 | 19 | 17 | 24 | 27 |
| 15 | 23 | -- | 33 | -- | 19 | -- | -- | -- |
| 16 | 25 | 35 | 24 | 16 | 24 | 16 | 27 | 32 |
| 17 | 22 | 22 | 27 | 23 | 19 | 28 | 32 | 26 |
| 18 | 32 | -- | 18 | -- | 23 | -- | 26 | -- |
| 19 | 32 | 46 | 24 | 15 | 22 | 17 | 23 | 22 |
| 20 | 23 | -- | 33 | -- | 21 | -- | 23 | -- |
| 21 | 18 | -- | 26 | -- | 33 | -- | 23 | -- |
| 22 | 25 | 36 | 23 | 14 | 32 | 25 | 21 | 25 |
| 23 | 27 | 52 | 34 | 12 | 22 | 25 | 16 | 11 |
| 24 | 25 | 27 | 30 | 29 | 23 | 24 | 22 | 19 |
| Mean Percentage | 27 | 33 | 26 | 16 | 26 | 25 | 21 | 25 |
| N | 3585 | 860 | 3284 | 469 | 3270 | 671 | 2908 | 660 |

between teacher behavior and student response is one of the stickiest methodological quagmires in educational research (Gage, 1972). Research on teacher characteristics and behavior must deal with this problem, however, if it is to justify the continued use of research resources. A central purpose of this study was to examine teacher behavior and student engagement; the extent to which the study was successful is explored in this section.

Specific short-term teacher strategies are only one source of influence on student engagement. Earlier in this report, for example, data were presented which indicate that the size of instructional group shows a clear relationship to level of engagement. From both a common sense and a theoretical point of view, however, it seemed plausible that the teacher is the primary source of influence on student engagement.

Four methods were used to examine this hypothesized association: (a) a comparison of patterns of teacher strategies used by teachers whose classes showed high average levels of engagement and those whose classes showed lower levels, (b) a comparison of types of engagement (receptive versus expressive) elicited by each strategy, (c) an examination of the tendency of teachers to teach in relatively small groups, and (d) computation of "impact" scores intended to show, on the average, the relative effectiveness of each strategy in producing engagement.

The complexity of the interaction between teacher and class is such that any attempt to identify systematic relationships is faced with enormous methodological problems. Although it is easy to identify teachers at the extremes--those who can keep a class at a high level of attention or engagement and those whose classes are disruptive--in the mid-range it is much more difficult to establish systematic relationships between types of teacher behavior and levels of student interest.

The general approach taken in this study was to attempt to identify teachers with a relatively high level of engagement and to observe specific techniques they used in their classrooms. Methodologically, this is a relatively simple approach and obviously obscures a great deal of variation from moment to moment in levels of engagement and the ways in which engagement is related to what a teacher has or has not done. In

an initial attempt to discover relationships between teacher and student behaviors, this more global approach was taken, using mean levels of student engagement over observation periods of 30 minutes. This type of analysis did not permit a careful examination of the moment-to-moment levels of engagement of the class and how these might have been produced by preceding teacher behavior.

Interpretation of the results of this study is therefore complicated by several methodological obstacles. Although most of these have been overcome in the fieldwork being conducted in the 1972-1973 school year, they do apply to the interpretation of the data presented in this memorandum. One of these difficulties is that teachers used more than one strategy either simultaneously or within a very short period of time. In the observations for this study an average of three strategies per 10 seconds of observation was found. It was not unusual for a teacher to use as many as five strategies within 10 seconds. This obviously made it difficult to separate the impact of a specific strategy from the impact of others used.

A second problem is that for each interval of observation, the behavior of only one child was seen. This gives a relatively narrow base of classroom behavior with which to match a strategy used with engagement levels. From observations of classrooms in this study, it can be noted that a given child's level of engagement may vary a great deal from moment to moment. The procedure of observing only one child at a time helped establish average levels of engagement over observational periods of a half hour, but complicated the simultaneous plotting of teacher strategies with student engagement.

A third difficulty that an analysis of this type faces is that student observations were planned to sample roughly one-third of the class, moving from one student to another in succeeding 10-second intervals. The consequences of this procedure were that the student being observed was not always the one interacting with the teacher, that is, a particular strategy might be directed toward a given child or a small group in one part of the classroom, while the observers were rating a student not in direct interaction with the teacher. This procedure has been modified,

but it does apply to data reported here. The relationships that do appear in this section therefore are probably underestimates of the true impact of teacher behavior on student engagement.

Patterns of strategy use by high- and low-engaging teachers. Although there was considerable variation in levels of student engagement from one observational round to the next for each individual teacher, the overall mean level of engagement, as indicated by percentage of students engaged, is considerably higher for some teachers than for others (see Figure 6). It seemed plausible to expect that teachers with high levels of engagement in their classrooms would display a somewhat different pattern of behavior than teachers with less engaged classes.

What strategies do relatively successful teachers use? It would be expected from the conceptual orientation of the study that more strategies would be found indicating variation in stimulus, in techniques that tend to personalize and express affective tone, and possibly in those strategies that give the student feedback, put him in competition with other students, and reward him for his accomplishments. These expectations were only partially supported by the comparison of high-engaging with low-engaging teachers as shown in Figure 11.

The greatest difference between the two groups appeared in the category Listens. Differences in other categories were in this expected direction, but were less impressive. The low-engaging teachers exceeded the highs in the use of Commands as strategies for interacting with the class. This contrast of the listening teacher versus the commanding teacher is certainly not contrary to expectations. The overall pattern of difference, however, between these two groups is less marked than had been anticipated.

Types of engagement elicited by strategies. Another way to examine the effect of teachers on the classes is to look at the different types of engagement and disengagement that appeared in each of the teachers' classrooms. Four global ratings were made: Expressive Engagement (which indicated some activity on the part of the child), Receptive Engagement (which indicated levels of attention that were relatively passive), Passive Disengagement (which indicated lack of interest, but

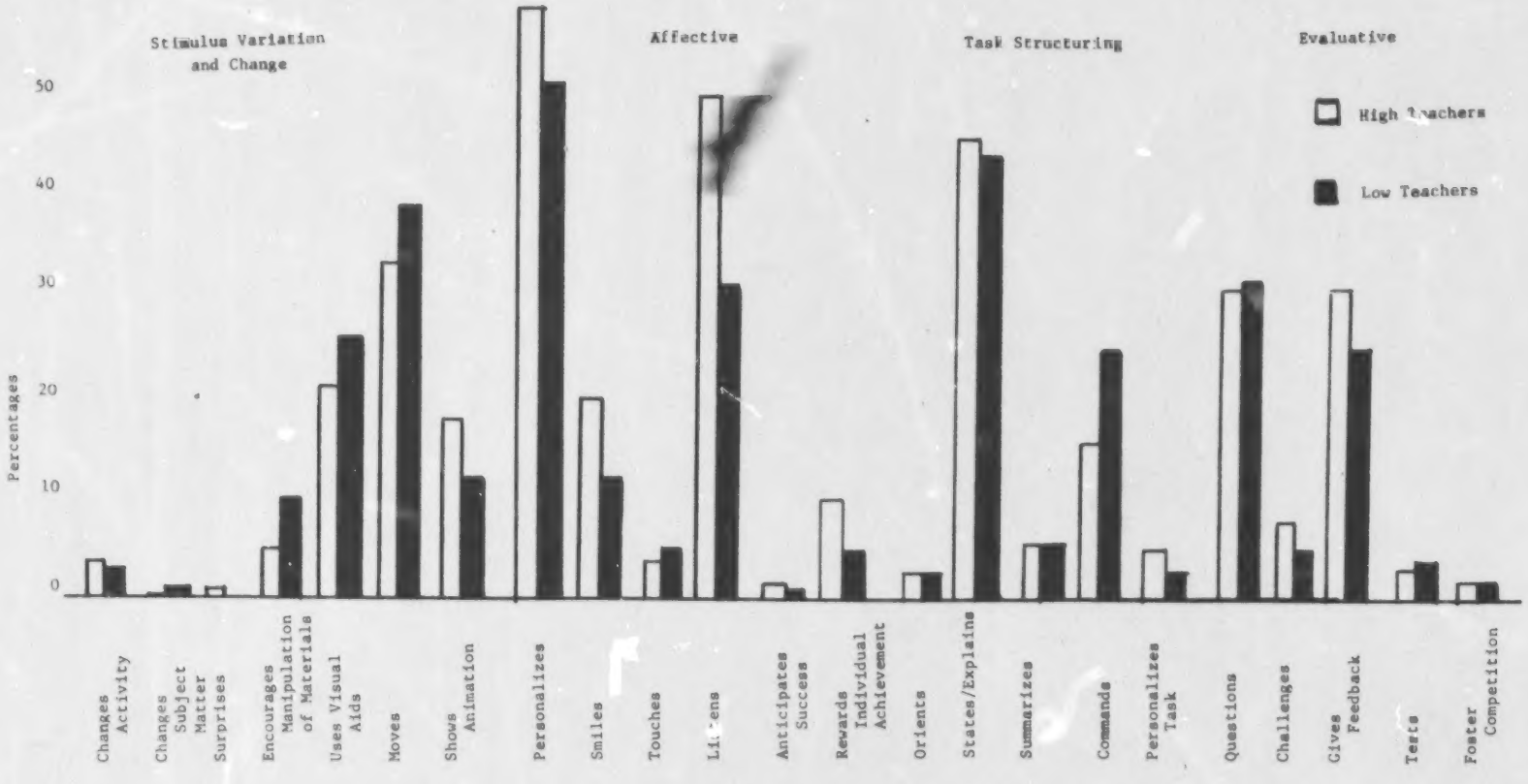


Fig. 11. Profile of strategy use for high- and low-engaging teachers (percentages for all rounds).

not active disruption), and Disruptive Disengagement (which included behavior designed to disengage the attention of other students in the class). The overall patterns of percentage of students engaged or disengaged in each of the four modes is shown in Table 11.

TABLE 11

Percentage of Modes of Global Student Engagement for Each Teacher (Means for Four Observation Rounds)

| Teacher | Receptive | Expressive | Passive | Disruptive |
|---|---|---|---|---|
| 1 | 36.8 | 48.5 | 11.3 | 3.5 |
| 2 | 34.4 | 49.0 | 13.7 | 2.8 |
| 3 | 32.8 | 50.7 | 10.6 | 6.0 |
| 4 | 36.1 | 44.9 | 13.3 | 5.8 |
| 5 | 29.2 | 48.0 | 19.0 | 3.9 |
| 6 | 31.2 | 36.8 | 26.1 | 6.0 |
| 7 | 35.0 | 48.1 | 12.0 | 5.0 |
| 8 | 33.9 | 37.0 | 23.5 | 5.7 |
| 9 | 33.4 | 48.6 | 12.3 | 5.8 |
| 10 | 39.9 | 44.4 | 10.5 | 5.2 |
| 11 | 30.6 | 53.8 | 10.4 | 5.3 |
| 12 | 28.4 | 51.7 | 17.0 | 3.0 |
| 13 | 41.9 | 42.6 | 12.3 | 3.3 |
| 14 | 30.8 | 55.0 | 11.6 | 2.7 |
| 15 | 23.3 | 51.7 | 20.8 | 4.3 |
| 16 | 26.9 | 58.2 | 10.8 | 4.1 |
| 17 | 32.0 | 42.3 | 10.1 | 6.7 |
| 18 | 55.9 | 26.3 | 13.5 | 4.4 |
| 19 | 26.5 | 53.9 | 14.1 | 5.5 |
| 20 | 34.1 | 40.7 | 19.8 | 5.5 |
| 21 | 22.0 | 56.8 | 17.0 | 4.3 |
| 22 | 37.2 | 44.6 | 16.5 | 1.8 |
| 23 | 28.8 | 41.4 | 21.2 | 8.7 |
| 24 | 34.8 | 47.8 | 14.7 | 2.8 |

Expressive engagement ranged from a high of 58 percent to a low of 26 percent. Perhaps of greatest interest was the proportion of expressive to receptive engagement for the various teachers. In a few instances, more than twice as many students were engaged in expressive ways than receptive ways. For several teachers, the levels were very similar with the two types of engagement.

In order to examine the possibility that differences in types of engagement (expressive versus receptive) were related to differential strategy use, teachers were divided into the two groups--those with a high ratio of expressive to receptive and those with a low ratio. Mean strategy patterns for each group are shown in Table 12.

TABLE 12

Percentage of Strategy Use for Teachers with High and Low Proportions of Expressive to Receptive Engagement

| Strategies | High E:R Ratios (Teachers 15,16,19,20) | Low E:R Ratios (Teachers 6,8,10,13) |
|---|---|---|
| Changes Activity | 2.8 | 2.8 |
| Changes Subject Matter | 0.2 | 0.2 |
| Surprises | 0.1 | 0.0 |
| E. Man. M. | 10.3 | 6.0 |
| Uses Visual Aids | 26.5 | 20.3 |
| Moves | 43.5 | 34.8 |
| Shows Animation | 13.3 | 18.3 |
| Personalizes | 53.5 | 51.8 |
| Smiles | 15.5 | 13.8 |
| Touches | 4.8 | 3.8 |
| Listens | 29.8 | 43.5 |
| Anticipates Success | 1.0 | 1.1 |
| R.I.A. | 6.3 | 7.3 |
| Orients | 2.8 | 3.5 |
| States/Explains | 44.0 | 50.0 |
| Summarizes | 7.5 | 5.5 |
| Commands | 17.0 | 24.5 |
| Personalizes Task | 4.3 | 2.8 |
| Questions | 29.8 | 28.3 |
| Challenges | 8.0 | 5.8 |
| Gives Feedback | 30.0 | 23.5 |
| Tests | 0.0 | 4.5 |
| Fosters Competition | 2.0 | 1.3 |

Table 12 shows that teachers who had a high ratio of expressive to receptive engagement tended to move about more and to use more feedback and visual aids. Teachers with relatively higher levels of receptive engagement tended to listen more, to use more commands, and to employ more statements and explanations in their teaching.

Patterns of strategy use during times of high engagement. Another way to examine the possible relationship between teacher strategies and student engagement is to look at those times when engagement was particularly high and when it was relatively low for a given teacher. If engagement varied for a teacher in her own class, but there was no corresponding change in the kinds of strategies the teacher used, it is reasonable to assume that the sources of variation in student engagement lay outside the specifics of teacher behavior. The data on this point are summarized in Table 13.

From these detailed data on a few individual teachers, it is difficult to argue that there is a clear relationship between use of strategies and levels of engagement.

Grouping and engagement. Another way teachers may influence the levels of interest of their classes is not through specific techniques and strategies, but in the ways that they arrange the instructional environment. From data presented previously, it would appear that the most effective way for a teacher to do this is to alter the size of instructional groups. By using small group and dyadic instruction more often, she should be able to raise the level of engagement and involvement of her students. The tendency to select certain kinds of instructional groupings is thus related to levels of student engagement. The data on differences among teachers in the extent to which they used small group and dyadic instruction are shown in Table 14. The relationship between the percentage of use of dyadic and small group instruction and overall percentages of engagement for the 24 teachers was found to be significant ($p < .05$, Spearman rank order correlation).

Impact scores. The most detailed analysis of the impact of the teachers upon their classes in terms of levels of engagement took the form of impact scores computed for all teachers by each individual

TABLE 13

Individual Teacher Strategy Use at Times of High and Low Engagement

| Strategy | Teacher 1 | | | Teacher 6 | | |
|---|---|---|---|---|---|---|
| | Low Engagement (76%) Frequency | High Engagement (100%) Frequency | Strategy Impact Rating | Low Engagement (38%) Frequency | High Engagement (89%) Frequency | Strategy Impact Rating |
| Chg.Act. | 0 | 2 | medium | 2 | 0 | medium |
| Chg.S.M. | 0 | 0 | none | 0 | 0 | high |
| Surp. | 0 | 0 | high | 0 | 0 | none |
| E.Man.M. | 0 | 0 | high | 21 | 0 | high |
| U.Vis.A. | 1 | 0 | medium | 21 | 11 | high |
| Moves | 71 | 26 | low | 54 | 22 | medium |
| Sh.Anim. | 26 | 16 | medium | 69 | —[a] | low |
| Pers. | 22 | 36 | medium | 35 | 50 | medium |
| Smiles | 54 | 29 | medium | 14 | 2 | medium |
| Touches | 2 | 2 | low | 0 | 4 | high |
| Listens | 49 | 9 | low | 13 | —[a] | low |
| A.Suc. | 1 | 1 | high | 1 | 0 | medium |
| R.I.A. | 1 | 6 | low | 2 | 1 | low |
| Orients | 5 | 5 | high | 4 | 0 | medium |
| Sts./Exp. | 28 | 77 | medium | 48 | 28 | high |
| Sums. | 0 | 0 | high | 21 | 0 | low |
| Comds. | 18 | 0 | low | 35 | 43 | high |
| P.Tsk. | 6 | 0 | low | 1 | 0 | high |
| Quest. | 12 | 25 | medium | 34 | 35 | medium |
| Chall. | 5 | 0 | medium | 15 | 1 | low |
| G.Fdbk. | 12 | 35 | high | 23 | 17 | medium |
| Tests | 0 | 0 | high | 0 | 6 | high |
| F.Comp. | 0 | 0 | none | 0 | 2 | low |

[a]These strategies were not listed on the instrument during the rounds in which these times occurred.

TABLE 14

Teacher Use of Dyadic and Small Instructional Groups and Student Engagement Levels (Four Rounds Combined)

| Teacher Code | Total Student Observations All Groupings | Percentage of Dyadic-Small Groups | Percentage of Student Ratings Engaged |
|---|---|---|---|
| 9 | 689 | 44.7 | 82.0 |
| 14 | 661 | 41.1 | 85.6 |
| 2 | 643 | 39.3 | 83.8 |
| 19 | 607 | 36.1 | 81.3 |
| 13 | 681 | 33.2 | 84.4 |
| 6 | 645 | 33.2 | 68.5 |
| 8 | 679 | 29.5 | 71.4 |
| 16 | 687 | 24.9 | 85.2 |
| 22 | 645 | 24.8 | 81.5 |
| 1 | 717 | 23.7 | 85.2 |
| 4 | 643 | 22.7 | 80.9 |
| 10 | 656 | 20.1 | 84.2 |
| 3 | 700 | 18.1 | 83.4 |
| 17 | 648 | 15.7 | 74.2 |
| 24 | 705 | 14.9 | 82.9 |
| 11 | 700 | 14.1 | 84.4 |
| 23 | 668 | 12.0 | 69.6 |
| 12 | 693 | 8.5 | 80.0 |
| 7 | 690 | 8.0 | 82.8 |
| 5 | 623 | 3.4 | 77.4 |
| 21 | 670 | 3.1 | 79.1 |
| 20 | 653 | 2.6 | 74.9 |
| 15 | 645 | 0.6 | 75.1 |
| 18 | 616 | 0.6 | 81.8 |

strategy. The method for computing the impact score was to take the number of students engaged while a given strategy was being used times the intensity of engagement, and subtract from that sum the number of students disengaged times the level of disengagement while the strategies were being used and divide this figure by the total number of times this strategy was employed. Or:

$$\text{Impact} = \frac{fE(xEi) - fD(xDi)}{f \text{ Strategy Use}}$$

The impact score provided a rough index of the engagement effect of each individual strategy, taking into account the number of times it was used as well as the effect it had on the students.

There was considerable variation in the effectiveness of different kinds of strategies, as is apparent in Table 15.

From data for all teachers in all rounds, the use of Surprises and the tendency to Anticipate Success on the part of the student seemed to be particularly effective. Somewhat less impact was shown by Rewards Individual Achievement, Smiles, and Personalizes the Task.

At the other extreme, Summarizes, Commands, Touches, and Orients appeared to be less effective in producing high levels of engagement. The impact for Touches may be a function of a lack of sensitivity on the Teacher Strategy Instrument for this category. It is clear from observer reports and teacher feedback that a student may be touched in several ways: as a mark of affection, in a constraining manner, or in a disciplinary fashion. New procedures in the 1972-1973 study permit distinctions between these types of behavior, but in these data Touches can mean quite different kinds of things.

Perhaps of even greater interest was the variation among teachers in the extent to which a given strategy had impact upon the class. On some strategies there was relatively little variation, as in Fosters Competition or Surprises; on others there was an enormous range of effectiveness. For example, Encourages Manipulation of Materials is a strategy that when used by some teachers actually disengaged the students. The same was true for the category Summarizes and for some others in the list. The individual differences in Shows Animation may indicate a kind of vivaciousness that may be effective in some teachers but not in others.

Impact scores for each strategy for each teacher are given in Table 16. The data in this table are quite convincing. While there is resistance to falling back on the truism that it is "not what a teacher does, but how she does it," as a way to explain the findings, it does seem evident from these results that a teacher may find one strategy

TABLE 15

Impact Scores for All Teachers Combined and Range of Individual Scores for Each Strategy

| Strategy | Impact Score: All Teachers | Lowest Impact Score | Highest Impact Score |
|---|---|---|---|
| Surprises | 1.85 | -2.00 | 4.00 |
| Anticipates Success | 1.57 | .00 | 2.67 |
| Rewards Individual Achievement | 1.44 | .11 | 2.67 |
| Smiles | 1.43 | .39 | 2.02 |
| Personalizes Task | 1.42 | .42 | 2.59 |
| Fosters Competition | 1.39 | -2.00 | 2.40 |
| Questions | 1.39 | .60 | 1.76 |
| Uses Visual Aids | 1.39 | .79 | 2.00 |
| Gives Feedback | 1.39 | .61 | 1.97 |
| Personalizes | 1.36 | .70 | 1.83 |
| Listens | 1.36 | .37 | 2.14 |
| States/Explains | 1.36 | .72 | 1.76 |
| Encourages Manipulation of Materials | 1.35 | -2.00 | 2.24 |
| Changes Subject Matter | 1.34 | -2.00 | 2.00 |
| Shows Animation | 1.34 | -.27 | 3.25 |
| Changes Activity | 1.31 | -.40 | 2.08 |
| Moves | 1.31 | .68 | 1.78 |
| Challenges | 1.31 | .05 | 2.84 |
| Tests | 1.30 | -.04 | 2.00 |
| Orients | 1.29 | .40 | 2.00 |
| Touches | 1.26 | .43 | 2.00 |
| Commands | 1.25 | .73 | 1.89 |
| Summarizes | 1.22 | -.33 | 2.27 |

TABLE 16

Impact Scores for Each Strategy for Each Teacher

| Teacher Code | Surp. | A.Suc. | R.I.A. | Smiles | P.Tsk. | F.Comp. | Quest. | U.Vis.A. |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.91 | 2.13 | 1.35 | 1.83 | 1.60 | -- | 1.76 | 1.89 |
| 2 | -- | 2.50 | 1.52 | 1.68 | 1.21 | 1.45 | 1.45 | 1.59 |
| 3 | -- | 2.22 | 1.31 | 1.51 | 2.00 | 1.47 | 1.41 | 1.68 |
| 4 | -- | 2.50 | 1.19 | 1.58 | 1.51 | 1.43 | 1.36 | 1.12 |
| 5 | -2.00 | 1.40 | 0.67 | 1.50 | .80 | 2.40 | 1.25 | 1.59 |
| 6 | -- | 0.50 | 0.11 | 0.39 | 1.25 | -1.25 | 0.60 | 0.85 |
| 7 | -- | 1.45 | 1.26 | 1.48 | 1.29 | 0.00 | 1.55 | 1.91 |
| 8 | -- | 0.00 | 0.42 | 1.01 | 2.00 | 1.20 | 0.88 | 1.01 |
| 9 | -- | 1.14 | 1.71 | 1.63 | 2.37 | -- | 1.59 | 1.45 |
| 10 | -- | 2.67 | 2.26 | 1.95 | 1.24 | 2.29 | 1.70 | 2.00 |
| 11 | 2.00 | 1.39 | 1.45 | 1.52 | 1.65 | 1.56 | 1.52 | 1.56 |
| 12 | -- | 1.63 | 1.57 | 1.40 | 1.42 | -2.00 | 1.36 | 1.21 |
| 13 | 2.00 | 2.00 | 1.95 | 2.02 | 2.39 | 1.12 | 1.76 | 1.43 |
| 14 | 2.00 | 1.71 | 1.73 | 1.55 | 2.00 | 1.85 | 1.61 | 1.59 |
| 15 | -- | 0.86 | 1.41 | 1.12 | 1.04 | 1.22 | 1.15 | 1.01 |
| 16 | 2.00 | 2.00 | 1.39 | 1.33 | 1.82 | 1.27 | 1.63 | 1.57 |
| 17 | -- | 1.33 | 0.83 | 1.12 | 1.63 | 1.50 | 1.13 | 1.32 |
| 18 | -- | 1.33 | 1.55 | 1.04 | 0.99 | 2.00 | 1.55 | 1.55 |
| 19 | -- | 1.43 | 1.00 | 1.43 | 0.82 | 2.00 | 1.47 | 1.18 |
| 20 | 4.00 | 1.43 | 0.90 | 1.85 | 1.33 | 1.87 | 1.03 | 1.51 |
| 21 | -- | -- | 2.67 | 1.57 | 0.90 | 1.67 | 1.71 | 1.20 |
| 22 | 1.71 | .67 | 1.57 | 1.30 | 1.18 | 2.00 | 1.62 | 1.34 |
| 23 | -- | 0.00 | 0.85 | .50 | 0.42 | -- | 0.84 | 0.79 |
| 24 | -- | 1.73 | 1.55 | 1.47 | 2.59 | 0.89 | 1.38 | 1.68 |
| ALL | 1.85 | 1.57 | 1.44 | 1.43 | 1.42 | 1.39 | 1.39 | 1.39 |

Table 16 (cont'd.)

| Teacher Code | G.Fdbk. | Pers. | Listens | Sts./Exp. | E.Man.M. | Chg.S.M. | Sh.Anim. | Chg.Act. |
|---|---|---|---|---|---|---|---|---|
| 1 | 19.2 | 1.67 | 1.27 | 1.76 | 2.11 | -- | 1.69 | 1.89 |
| 2 | 1.47 | 1.56 | 1.15 | 1.62 | 1.57 | 0.66 | 1.28 | 2.17 |
| 3 | 1.33 | 1.51 | 1.36 | 1.49 | 1.11 | 1.79 | 1.14 | 1.67 |
| 4 | 1.31 | 1.27 | 1.31 | 1.18 | 1.33 | -2.00 | -0.10 | 1.67 |
| 5 | 1.23 | 1.13 | 0.95 | 1.03 | 1.35 | 2.00 | -0.89 | 0.33 |
| 6 | 0.63 | 0.70 | 0.37 | 0.72 | 0.83 | 2.00 | -0.27 | 0.41 |
| 7 | 1.60 | 1.43 | 1.52 | 1.45 | 2.00 | -2.00 | 1.50 | 0.83 |
| 8 | 0.61 | 0.96 | 0.94 | 0.95 | 1.83 | 2.00 | 0.22 | -0.40 |
| 9 | 1.26 | 1.37 | 1.54 | 1.49 | 1.78 | -- | 1.71 | 1.33 |
| 10 | 1.69 | 1.60 | 1.82 | 1.66 | 2.24 | 2.00 | 1.67 | 0.79 |
| 11 | 1.48 | 1.47 | 1.52 | 1.56 | 1.38 | 2.00 | 1.85 | 1.70 |
| 12 | 1.60 | 1.33 | 1.01 | 1.37 | 1.70 | 2.00 | 1.20 | 1.83 |
| 13 | 1.85 | 1.83 | 1.75 | 1.69 | 2.00 | 2.00 | 1.32 | 1.29 |
| 14 | 1.97 | 1.65 | 2.14 | 1.62 | 2.00 | 1.00 | 3.25 | 2.08 |
| 15 | 1.04 | 1.10 | 0.82 | 0.93 | 1.43 | 2.00 | 1.10 | 1.20 |
| 16 | 1.31 | 1.41 | 1.44 | 1.60 | 1.19 | 2.00 | 1.07 | 0.50 |
| 17 | 1.26 | 1.10 | 1.15 | 1.20 | 1.38 | 1.60 | 1.06 | 0.33 |
| 18 | 1.46 | 1.44 | 1.28 | 1.42 | -2.00 | 2.00 | 1.44 | 1.80 |
| 19 | 1.25 | 1.36 | 1.81 | 1.46 | 1.15 | -- | 1.49 | 0.86 |
| 20 | 1.25 | 1.18 | 0.60 | 0.98 | 0.12 | -1.00 | 0.13 | 1.36 |
| 21 | 1.29 | 1.34 | 1.13 | 1.67 | 1.40 | 2.00 | 3.20 | 1.47 |
| 22 | 1.42 | 1.36 | 1.17 | 1.40 | 1.10 | 2.00 | 1.47 | 1.71 |
| 23 | 0.82 | 0.90 | 0.53 | 0.86 | 0.00 | -- | 0.45 | 1.56 |
| 24 | 1.53 | 1.55 | 1.63 | 1.52 | 1.43 | 1.29 | 2.03 | 1.06 |
| ALL | 1.39 | 1.36 | 1.36 | 1.36 | 1.35 | 1.34 | 1.34 | 1.31 |

Table 16 (cont'd.)

| Teacher Code | Moves | Chall. | Tests | Orients | Touches | Comds. | Sums. | Mean of All Strategies |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.63 | 1.82 | 2.00 | 1.91 | 0.85 | 1.37 | 2.02 | 1.73 |
| 2 | 1.30 | 0.95 | 1.63 | 1.71 | 0.97 | 1.63 | 1.51 | 1.60 |
| 3 | 1.42 | 1.59 | 1.58 | 1.84 | 1.52 | 1.61 | 1.47 | 1.55 |
| 4 | 1.13 | 1.21 | 2.00 | 2.20 | 1.31 | 1.25 | 1.10 | 1.22 |
| 5 | 1.23 | 0.61 | — | 0.80 | 0.70 | 1.15 | 1.12 | 1.01 |
| 6 | 0.68 | 0.14 | 2.00 | 0.59 | 0.77 | 0.72 | -0.33 | 0.56 |
| 7 | 1.16 | 1.94 | 1.80 | 1.28 | 1.80 | 1.36 | 2.27 | 1.31 |
| 8 | 1.04 | 0.07 | 1.59 | 0.85 | 0.89 | 0.88 | 0.35 | 0.88 |
| 9 | 1.36 | 1.69 | — | 1.44 | 0.43 | 1.20 | 1.81 | 1.49 |
| 10 | 1.69 | 1.25 | 1.49 | 1.73 | 1.09 | 1.55 | 1.50 | 1.72 |
| 11 | 1.78 | 1.62 | 2.00 | 1.52 | 1.70 | 1.44 | 1.66 | 1.63 |
| 12 | 1.21 | 1.35 | 1.82 | 1.20 | 1.50 | 1.19 | 1.22 | 1.28 |
| 13 | 1.61 | 2.07 | 1.88 | 1.64 | 1.67 | 1.56 | 1.55 | 1.76 |
| 14 | 1.55 | 2.84 | 1.68 | 1.64 | 0.80 | 1.89 | 1.98 | 1.83 |
| 15 | 1.27 | 0.88 | — | 0.40 | 0.65 | 0.89 | 1.11 | 1.08 |
| 16 | 1.38 | 1.28 | — | 2.00 | 1.67 | 1.71 | 0.79 | 1.47 |
| 17 | 1.20 | 1.06 | 1.71 | 1.13 | 2.00 | 1.17 | 1.29 | 1.25 |
| 18 | 1.53 | 1.11 | — | 0.83 | 1.52 | 1.50 | 0.88 | 1.25 |
| 19 | 1.65 | 1.38 | — | 0.94 | 1.62 | 1.16 | 1.23 | 1.33 |
| 20 | 1.01 | 1.18 | -0.04 | 0.81 | 1.47 | 1.28 | 2.08 | 1.14 |
| 21 | 1.34 | 1.07 | — | 1.12 | 2.00 | 1.20 | 0.78 | 1.54 |
| 22 | 0.99 | 0.95 | 0.90 | 1.20 | 1.26 | 1.24 | 2.12 | 1.38 |
| 23 | 0.98 | 0.05 | — | 1.37 | 1.02 | 0.99 | 0.00 | 0.68 |
| 24 | 1.41 | 1.15 | 1.79 | 1.09 | 1.79 | 1.10 | 0.95 | 1.48 |
| ALL | 1.31 | 1.31 | 1.30 | 1.29 | 1.26 | 1.25 | 1.22 | |

effective that another teacher does not find as useful. It appears then that it was the effectiveness with which a given teacher used a strategy and the frequency with which she used it that produced the levels of engagement that we have observed. Another way of saying this is that no teacher is without some effective strategy, though some teachers have a greater number of highly effective strategies than do others. The implications of this for teacher training and feedback are obvious. If teachers are able to recognize and increase the use of their most effective strategies, there should be a measurable effect on their classes. These possibilities are being explored in a study by one of the authors, Anne Morton.

## Teacher Feedback Workshop

Before the first round of observations, the project staff contracted with the sample teachers to provide them with feedback based on the data gathered in their classrooms. This commitment was honored at a Teacher Feedback Workshop held at Stanford on May 6, 1972. Of the 24 sample teachers, 21 participated in the day-long workshop.

The morning session covered the project aims and procedures. Detailed descriptions of the observation instruments were also presented. A report of findings based on analysis of group data was presented to provide a context for understanding the individual data analysis given to teachers in the afternoon sessions. Results were presented in non-technical language and graphics were used to illustrate specific points.

In the afternoon sessions, each teacher received individualized feedback from a staff member trained in that technique. Procedures were developed by the project staff to use videotapes as a means for discussing individual data analysis based on classroom observations (Takanishi-Knowles, 1973). The discussions centered on analysis of individual teacher data. Teachers had been asked before coming to the workshop what kinds of information they wanted from the feedback sessions, and their responses formed an additional basis for "individualization" of the feedback. Group data were available for comparison if the teacher desired; the focus of inquiry, however, was the individual teacher. Questions

covered for group data were applied to individual data: e.g., What strategies do you use most often? What strategies do you use least? Which specific strategies appear to have the most impact on student engagement in your class? Which specific strategies appear to have the least impact on student engagement in your class?

The findings presented at the workshop may have positive consequences for the teachers' behavior. Sixteen out of seventeen teachers reported that they had learned something new about their teaching. Twelve of the teachers thought that they should change some of the ways they teach, and sixteen said the results and discussions in the workshop could really help teachers change their teaching behavior. Sixteen of the teachers thought that the results would be useful to classroom teachers in general, and all replied that they believed educational research can produce information useful to teachers.

## Summary and Discussion

In the initial phase of the project, several objectives were established:

1. To formulate a conceptual framework for the study of conditions related to engagement in the classroom.
2. To develop instruments for measuring teacher strategies and student engagement.
3. To identify teacher strategies that are associated with student engagement and disengagement in natural classroom settings.
4. To study the relationship of contextual variables (size of instructional group, subject matter) to teacher strategies and student engagement.
5. To examine the relationship between pupil characteristics (age, sex, ethnicity) and levels of engagement.
6. To develop models for collaborative relationships between educational researchers and school staffs and teacher-feedback procedures of data gathered by classroom observation.

During the first two years of research, teacher strategies hypothesized to be associated with student engagement and disengagement in natural classroom settings were examined. The research paradigm used for

studying the relationship between teacher strategies and student engagement was that teacher instructional strategies are clusters of stimuli or behaviors that are transmitted by the teacher to affect the student in accordance with some objective. From these clusters, teacher engagement strategies can be separated, described, and observed in the classroom. Contextual variables may affect the occurrence of certain teacher strategies and student behaviors. Teacher strategies received by the student may lead to certain hypothesized inner states in the student, including epistemic curiosity, dissonance, competence motivation, and achievement motivation. Finally, these states are manifested by specific, observable behavioral indicators of student engagement. Student variables are characteristics such as sex and ethnicity. Observations of student engagement may provide some teachers with feedback, a basis upon which to alter their engagement strategies.

In the 1971-1972 data analysis, attention was focused on the observation of teacher engagement strategies and student engagement and relationships between them. A Teacher Strategies Instrument and a Student Engagement Instrument were developed to measure strategies and engagement.

The results of the initial phase of the study indicated that there were large variations in student engagement from one observation period to another. There were also consistent differences among teachers in student engagement levels in their classrooms.

The sources of variation in student engagement were examined for effects of sex and ethnicity of the student, size of instructional group, and subject matter. The results of these analyses can be summarized: (a) Although there was a tendency for females to be more engaged than males, no significant differences in student engagement by sex were found. (b) There were no significant ethnic group differences in engagement. (c) Significant differences in student engagement were found between small and large groups ($p < .05$) and between dyadic and large groups ($p < .05$), but no differences appeared between dyadic and small group engagement. (d) There were no significant differences in student engagement in three subject matter areas--language arts, reading, and

mathematics.

There were large variations among teachers in the frequency of strategy use during observation times. Teacher strategy use also varied consistently by size of instructional group. Affective class strategies were used most often in dyadic-small groups, while Stimulus Variation and Change Strategies occurred most frequently in large groups.

Using four different methods of analysis, no clear relationships were found between student engagement and teacher strategies. In sum, instructional grouping appeared to be the contextual variable most strongly related to student engagement and teacher strategies. The finding suggests that teachers may influence student engagement by the ways they structure the learning environment. Our data specifically point to the teacher's use of different sized instructional groups as a means of increasing student engagement. The relationship between the use of dyadic and small group instruction by teachers and levels of engagement was significant ($p < .05$).

These findings do not support our initial conception of engagement as following directly from specific techniques and instructional strategies used by the classroom teacher. This has led us to reformulate our conceptualization of the sources of variation in student engagement in the classroom.

Although engagement does not seem to be strongly related to the specifics of teacher instructional behavior, it is related to systematic variation in the educational environment. Our initial conception was not designed to explore carefully the relationship between molar features of the environment and engagement, but the data do reveal a significant relationship between engagement and instructional group size. It seems likely that engagement is also related to other contextual variables in the classroom environment.

Our design for 1972-1973 is constructed to examine some of these relationships more systematically. Comparisons of the same teachers and students will be made between self-contained and open classrooms. Separate observations are being made on students who are directed by the teacher and on those who are working independently of his or her direct

supervision. Data will be available from teachers and students at grade levels from kindergarten through sixth grade, and the design permits more precise comparison of the effects of subject matter (reading-language arts versus math). The composition of the student body affords a more adequate examination of the influence of ethnicity upon both teacher and student behavior, especially for Anglo and Mexican-American students, because these groups are more nearly equal in size than those in the 1971-1972 sample.

The findings of this initial phase of the study have led to a revised paradigm (Figure 12) for the study of classroom engagement. The

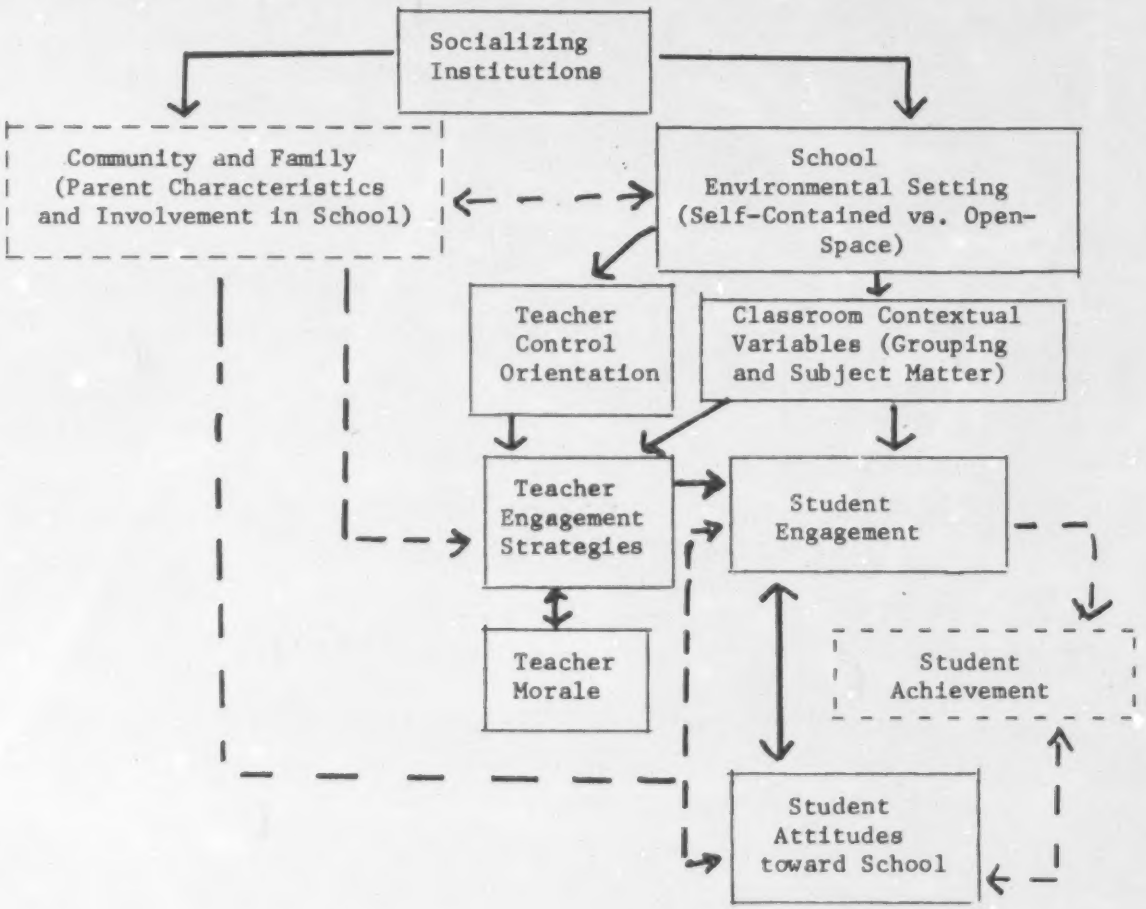
Socializing Institutions
Community and Family (Parent Characteristics and Involvement in School)
School Environmental Setting (Self-Contained vs. Open-Space)
Teacher Control Orientation
Classroom Contextual Variables (Grouping and Subject Matter)
Teacher Engagement Strategies
Student Engagement
Teacher Morale
Student Achievement
Student Attitudes toward School

Fig. 12. Expanded paradigm for 1972-1973 study (proposed expansions in dotted lines).

revised paradigm takes into account some structural and organizational features of the classroom and their possible influences on teacher strategies, student engagement, and the relationship between them. Data from this second phase of the field research should give us basic information needed to further refine a conceptual model of the effects of educational contexts on engagement.

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# APPENDIX A

## DEMOGRAPHIC DATA ON SAMPLE SCHOOLS

## Description of Sample Schools, School Year 1971-1972

Twenty-four third- and fourth-grade classrooms in the San Francisco Bay area were used in this study. Demographic information was gathered for each of the nine schools involved in the study.

A letter was sent from the Assistant to the Dean of the Stanford School of Education to the superintendents of school districts in the San Francisco Bay area requesting permission to contact principals of low-income area elementary schools. After obtaining permission from the school districts, staff members of the study contacted individual principals by phone. Most of the principals contacted agreed to cooperate. With the consent of the principals, staff members visited the schools to invite third- and fourth-grade teachers to participate in the study.

In one school district with a majority of Mexican-American students, although the principals expressed interest in the study, only two teachers agreed to participate. In another school district with a majority of Black students most of the principals declined to cooperate. The sample subsequently included twenty-four teachers who volunteered for the project.

The data-collection procedure involved three main steps. First, a form letter was sent to the principal of each school requesting information on:

Ethnic composition of the student population
Occupational levels of parents of school children
Income levels of parents of school children
Educational levels of parents of school children
Type of housing of school families
Family composition (1 or 2 parents/guardians)
Percentage of employed families
Percentage of welfare recipients
School classification: Title I status
Date of collection of the above data

Second, a member of the research team telephoned the principals to arrange for data collection. Two of the nine principals had the information

available and offered to forward it. Another supplied the information directly over the phone. The six remaining principals gave permission to gather the data from school files.

Third, three project members collected data from the six schools. A team of two members visited each school to collect demographic data from four sources.

1. Permanent record files of individual students.
2. Master lists of names of all the students in the schools and names of the adults (parents or guardians) who were responsible for the children in case of emergency. These lists provided the most current information on family composition.
3. Application forms for reduced/free lunch programs. These forms provided additional information on the economic needs of the families in the schools. The forms are not automatically issued to each family in the schools, however; in some of the schools, the students have to request the forms from the offices. Consequently, the number of children on the program does not necessarily reflect the number of families qualifying for the program.
4. Emergency card files. A sample of the student population was drawn by consulting every third card in the emergency card file or every third permanent record file on individual students. The size of this sample (one-third of the school population) was determined by the following formula:[3]

$$n = \frac{(1.96^2\ S^2)}{(d^2 + \frac{1.96}{N}\ S^2)}$$

where $n$ = Sample size

$S^2$ = Estimate of Variance

$d^2$ = Error Term

$N$ = Population size

The confidence level was set at .05. All names on the reduced/free lunch applications were used.

After the data were collected, the demographic information was summarized.

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[3]Eleanor Chiang, Statistician, and Charles Dunbar, Research Assistant of the Methodology Unit of the Stanford Center for Research and Development in Teaching, helped determine the sample size.

Data on ethnic distribution were obtained for all nine schools. Two of the schools had a sizable proportion of Black students (30 and 59 percent); seven had a majority of Spanish surname students, and one had a majority of Anglo students (60 percent).[4] Table A-1 shows the percentages of ethnic groups by schools.

Data on the occupational levels of both parents were obtained for seven of the nine schools. Category definitions were taken from Hess and Torney (1965). Six schools provided separate data for mothers and fathers. One school provided an average occupational level for both parents.

Parents in the seven schools hold jobs at similar levels. The occupational levels of the men appear to differ more than those of the women. The majority of fathers in six of the schools were in semiskilled and unskilled jobs. The middle-class professional category was the least frequent in five of the seven schools. In one school, it was the second most frequent level and in another the third most frequent.

The majority of mothers in the seven schools were homemakers. The second largest percentage held unskilled jobs. A small percentage held middle-class professional positions.

Table A-2 shows the percentages of parents at different occupational levels for the seven schools from which data were obtained.

Data on free or reduced cost lunch programs were available for seven of the nine schools. Three schools distributed the application form to each student. Three schools announced to the students the availability of the application forms in the office, and in one they were available on request. In five of the schools between 25 and 67 percent of the children were on these programs. In the other two schools, 6 and 10 percent of the children were on free or reduced-cost lunch programs.

Three of the nine schools are designated as Title I schools (code numbers 5, 8, and 9). Two schools had Title I classification in the past (code numbers 6 and 3) but are no longer funded.

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[4]The category "Mexican-American" used on the observation instruments is a subset of Spanish surname students. It was not possible to isolate this subset in the information obtained from school and census data.

TABLE A-1

Ethnic Group in Sample, in Percentage by School

| Ethnic Group | 1 (N=202) | 2[a] (N=300) | 3 (N=505) | 4 (N=420) | 5 (N=367) | 6 (N=276) | 7 (N=521) | 8 (N=639) | 9 (N=445) |
|---|---|---|---|---|---|---|---|---|---|
| Anglo | 54 | 23 | 56 | 56 | 38 | 31 | 72 | 21 | 60 |
| Spanish surname | 33 | 56 | 41 | 44 | 54 | 7 | 21 | 48 | 17 |
| Black | 1 | 4 | 1 | 1 | 4 | 59 | 2 | 30 | 8 |
| Asian American | 11 | 13 | 2 | 1 | 1 | 1 | 2 | 1 | 7 |
| Native American | 1 | 1 | -- | -- | 2 | -- | -- | -- | -- |
| Other Minorities | -- | 1 | -- | -- | 2 | 3 | 3 | -- | 6 |

[a]Computed from random sample.

TABLE A-2

Occupational Levels of Parent of School Children, in Percentage by School

| Occupational Level | 2 | | 3[a] | 5 | | 6 | | 7 | | 8 | | 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Males (N=64) | Females (N=70) | Total (N=505) | Males (N=89) | Females (N=93) | Males (N=54) | Females (N=75) | Males (N=123) | Females (N=128) | Males (N=125) | Females (N=180) | Males (N=142) | Females (N=140) |
| Unemployed, Seeking Work | 14 | 1 | 25 | 19 | 6 | 4 | 5 | 5 | 23 | 8 | 12 | 4 | 7 |
| Housewife | -- | 64 | -- | -- | 67 | -- | 47 | -- | 40 | -- | 66 | -- | 68 |
| Unskilled | 20 | 10 | 45 | 29 | 15 | 46 | 20 | 11 | 18 | 22 | 9 | 13 | 6 |
| Semiskilled[b] | 30 | 4 | 10 | 30 | 3 | 22 | 7 | 47 | 6 | 38 | 5 | 55 | 6 |
| Skilled[c] | 11 | 4 | 10 | 10 | 3 | 6 | 5 | 10 | 2 | 19 | 2 | 11 | 2 |
| Clerical Service | 22 | 11 | 5 | 9 | 6 | 9 | 11 | 13 | 10 | 7 | 5 | 9 | 9 |
| Middle-Class Professionals | 3 | 4 | 10 | 2 | -- | 13 | 5 | 14 | 2 | 5 | 1 | 8 | 3 |

[a]Computed from random sample submitted by school

[b]Includes military personnel

[c]Includes students

Fourth count (1970) census data were obtained for census tracts surrounding each of the sample schools. Percentages of families with children below the poverty level ($3,410 average) were computed for each of the sample school areas. It must be noted that the match between school attendance areas and census tracts is far from perfect. Table A-3 shows the percentages of families below poverty level and the total number of families in each ethnic group in the tracts around each school.

TABLE A-3

Families with Children Under 18 in Census Tracts
Surrounding Sample Schools
(Includes Single Parents--4th Count Data)

| School | Percent Below Poverty Level | | | | Total Number of Families | | | |
|---|---|---|---|---|---|---|---|---|
| | Black | Anglo | Sp-Amer. | Total | Black | Anglo | Sp-Amer. | Total |
| 1 | -- | 12 | 12 | 11 | -- | 421 | 127 | 476 |
| 2 | 19 | 16 | 14 | 15 | 85 | 2166 | 1483 | 2506 |
| 3 | -- | 8 | 12 | 8 | -- | 2809 | 991 | 2936 |
| 4 | -- | 21 | 28 | 21 | -- | 1524 | 855 | 1567 |
| 5 | 23 | 9 | 11 | 10 | 160 | 3095 | 866 | 3415 |
| 6 | 12 | 8 | 19 | 11 | 1141 | 544 | 181 | 1857 |
| 7 | 0 | 6 | 6 | 6 | 0 | 2698 | 480 | 2855 |
| 8 | 6 | 14 | 19 | 12 | 228 | 1745 | 1087 | 2087 |
| 9 | 0 | 8 | 15 | 9 | 88 | 2609 | 627 | 3102 |

# APPENDIX B

## OBSERVATION INSTRUMENTS

Used for Rounds I, II and III

STANFORD R & D CENTER - PROJECT 3C

OBSERVER _____

SCHOOL _____

TEACHER _____

LESSON _____

TEACHER STRATEGIES OBSERVATIONS INSTRUMENT

DATE _____

PAGE _____ OF _____

| TIME | SVC ACT | SVC MAT | SVC SUP | KNW | RVS | P SL | P PMS | P LIST | GA APLN | GII MOV | O | SUM | I | SQ | SAP | CT | CT CHAL | COM | P | P TASK | F | F SUG | F RIN | OTHER |
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STANFORD R & D CENTER - PROJECT 3C
OBSERVER_____
SCHOOL_____

Used for Rounds IV and V
ROUND_____
TEACHER_____
LESSON_____

TEACHER STRATEGIES OBSERVATION INSTRUMENT
DATE_____
PAGE_____OF_____ 1/72

| TIME | SVC ACT | SVC MAT | SVC S/N | KNN | TVS | P S/L | P PHYS | MOV | O | SUM | AM I | CT SQ | S/E | CT | CT CHAL | COM | P | P TASK | F | F SUC | F RIA | AM R | S/E NA | OTHER |
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STANFORD R & D CENTER
OBSERVER _____
SCHOOL _____

PROJECT 3C
TEACHER _____
LESSON _____

STUDENT OBSERVATION INSTRUMENT
DATE _____
PAGE ____ OF ____

| DESCRIPTIONS | TIME | SEX M | SEX F | RACE W | RACE B | RACE M | RACE O | MOTOR E | MOTOR D | VERBAL E | VERBAL D | VISUAL E | VISUAL D | GLOBAL ASSESSMENT R | GLOBAL ASSESSMENT E | GLOBAL ASSESSMENT P | GLOBAL ASSESSMENT D | DIRECTION N | DIRECTION T | DIRECTION A | DIRECTION M | DIRECTION P | GROUPING 2 | GROUPING S | GROUPING L |
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Supplemental Observation Data Sheet

TEACHER:_____ DATE:_____

OBSERVATION TIME:_____ ROOM NUMBER:_____

LESSON TAUGHT:_____ ETHNIC COUNT:_____

OBSERVER:_____ GRADE:_____

1. How was this class grouped? What kinds of activities were occuring?

_____

_____

_____

2. Describe any significant interruptions and the teacher's reaction to them.

_____

_____

_____

3. Were there any unusual circumstances affecting engagement (was the observer a significant distraction?)?

_____

_____

_____

4. Did the teacher ask any questions after the observation?

_____

_____

_____

5. Were there any technical problems (ie. with equipment) encountered during the observation?

_____

_____

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# APPENDIX C

## INTEROBSERVER AGREEMENT DATA

TABLE C-1

Agreement Percentages for Teacher Strategy Instrument Calibrations
(Four Observation Rounds)

| Category | Round I | Round II | Round IV | Round V | Mean for all rounds |
|---|---|---|---|---|---|
| Stimulus Variation and Change | | | | | |
| Chg.Act. | 97 | 98 | 99 | 97 | 98 |
| Chg.S.M. | 100 | 100 | 100 | 100 | 100 |
| Surp. | 100 | 100 | 100 | 100 | 100 |
| E.Man.M. | 97 | 100 | 99 | 98 | 98 |
| U.Vis.A. | 85 | 88 | 96 | 96 | 91 |
| Moves | 85 | 79 | 81 | 91 | 84 |
| Sh.Anim. | 85 | 97 | -- | -- | 91 |
| Class Mean | 93 | 94 | 96 | 97 | 95 |
| Affective | | | | | |
| Pers. | 71 | 68 | 87 | 81 | 77 |
| Smiles | 81 | 88 | 84 | 87 | 85 |
| Touches | 94 | 91 | 99 | 99 | 96 |
| Listens | 67 | 59 | -- | -- | 64 |
| A.Suc. | 97 | 97 | 99 | 99 | 98 |
| R.I.A. | 94 | 91 | 97 | 98 | 95 |
| Class Mean | 84 | 82 | 93 | 93 | 88 |
| Task Structuring | | | | | |
| Orients | 94 | 96 | 98 | 97 | 96 |
| Sts./Exp.[a] | 63 | 70 | 82 | 83 | 74 |
| Sums. | 90 | 91 | 92 | 88 | 90 |
| Comds.[a] | 81 | 75 | 92 | 95 | 86 |
| P.Tsk. | 96 | 93 | 97 | 99 | 96 |
| Class Mean | 85 | 85 | 92 | 93 | 86 |
| Evaluative | | | | | |
| Quest. | 68 | 83 | 78 | 85 | 78 |
| Chall. | 85 | 99 | 95 | 99 | 94 |
| G.Fdbk. | 66 | 77 | 74 | 72 | 72 |
| Tests | 99 | 00 | 99 | 00 | 00 |
| F.Comp. | 92 | 00 | 00 | 98 | 97 |
| Class Mean | 82 | 92 | 89 | 91 | 88 |
| All Strategies | 86 | 89 | 93 | 93 | 90 |

[a]The categories Request and States/Explains Nonacademic were separated from Commands and States/Explains for Rounds IV and V; however, the percentages here reflect the combined categories as these were used in the analysis of strategy data.

TABLE C-2

Agreement Percentages for Student Engagement Instrument Calibrations
(Four Observation Rounds)

| Category | Round I | Round II | Round IV | Round V | Mean for all rounds |
|---|---|---|---|---|---|
| Motor | | | | | |
| Engaged | 82 | 62 | 88 | 92 | 81 |
| Disengaged | 72 | 54 | 90 | 95 | 78 |
| Verbal | | | | | |
| Engaged | 96 | 85 | 94 | 92 | 92 |
| Disengaged | 88 | 88 | 97 | 96 | 92 |
| Visual | | | | | |
| Engaged | 91 | 81 | 83 | 92 | 87 |
| Disengaged | 89 | 83 | 83 | 92 | 87 |
| Global | | | | | |
| Receptive | 76 | 58 | 81 | 90 | 76 |
| Expressive | 76 | 58 | 88 | 90 | 78 |
| Passive | 81 | 88 | 85 | 94 | 87 |
| Disruptive | 95 | 100 | 97 | 97 | 97 |
| Direction | | | | | |
| Nontask | 84 | 87 | 87 | 91 | 87 |
| Teacher | 89 | 92 | 85 | 86 | 88 |
| Aide | — | — | 99 | 100 | 100 |
| Materials | 88 | 85 | 87 | 86 | 87 |
| Peers | 98 | 95 | 97 | 86 | 94 |
| Grouping | | | | | |
| Dyadic | 98 | 94 | 100 | 97 | 97 |
| Small | 92 | 95 | 99 | 100 | 96 |
| Large | 90 | 92 | 98 | 98 | 95 |
| Round Mean | 97 | 82 | 91 | 93 | 88 |

TABLE C-3

Teacher Strategy Frequencies Recorded by Calibrators and Observers (Mean for Calibration Periods for Each Round)

| Strategy | Round I | | Round II | | Round IV | | Round V | |
|---|---|---|---|---|---|---|---|---|
| | Cal. | Obs. | Cal. | Obs. | Cal. | Obs. | Cal. | Obs. |
| Changes Activity | 0.25 | 0.25 | 0.00 | 0.67 | 0.13 | 0.25 | 1.25 | 0.75 |
| Changes Subject Matter | 0.00 | 0.00 | 0.00 | 0.00 | 0.38 | 0.25 | 0.00 | 0.00 |
| Surprises | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 | 0.00 |
| Encourages Manipulation of Materials | 2.75 | 3.25 | 0.00 | 0.00 | 0.63 | 0.50 | 0.50 | 0.00 |
| Uses Visual Aids | 6.25 | 4.50 | 5.33 | 3.00 | 4.25 | 4.13 | 8.50 | 9.00 |
| Moves | 20.50 | 19.00 | 15.67 | 16.00 | 11.50 | 8.00 | 8.25 | 6.50 |
| Shows Animation[a] | 7.50 | 8.25 | 1.00 | 0.00 | -- | -- | -- | -- |
| Personalizes | 10.25 | 12.25 | 9.00 | 9.33 | 14.50 | 15.63 | 21.00 | 21.25 |
| Smiles | 5.25 | 6.25 | 3.00 | 4.00 | 4.25 | 4.63 | 5.50 | 4.50 |
| Touches | 1.00 | 2.50 | 2.00 | 2.33 | 1.00 | 1.13 | 0.25 | 0.00 |
| Listens[a] | 12.00 | 8.50 | 6.66 | 10.00 | -- | -- | -- | -- |
| Anticipates Success | 0.25 | 0.50 | 0.00 | 1.00 | 0.13 | 0.13 | 0.50 | 0.75 |
| Recognizes Individual Achievement | 1.50 | 2.00 | 1.33 | 4.33 | 1.25 | 1.38 | 0.75 | 1.00 |
| Orients | 1.00 | 1.50 | 1.00 | 0.66 | 0.88 | 0.75 | 0.50 | 0.75 |
| States/Explains[b] | 16.25 | 14.50 | 9.00 | 13.33 | 12.88 | 11.13 | 14.00 | 11.00 |
| Summarizes | 2.25 | 2.25 | 0.33 | 2.33 | 1.50 | 1.25 | 1.75 | 3.25 |
| Commands[b] | 6.25 | 8.25 | 1.66 | 8.33 | 4.38 | 5.13 | 2.75 | 4.50 |
| Personalizes Task | 0.50 | 0.50 | 1.66 | 0.33 | 0.88 | 1.00 | 0.25 | 0.00 |
| Questions | 7.25 | 8.75 | 8.33 | 8.66 | 10.25 | 7.63 | 14.75 | 12.75 |
| Challenges | 5.00 | 1.50 | 0.33 | 0.00 | 1.63 | 0.88 | 0.75 | 0.50 |
| Gives Feedback | 8.75 | 8.00 | 5.00 | 7.00 | 6.38 | 6.63 | 11.00 | 9.00 |
| Tests | 1.75 | 2.75 | 0.00 | 0.00 | 1.63 | 1.38 | 0.00 | 0.00 |
| Fosters Competition | 2.50 | 0.00 | 0.00 | 0.00 | 0.25 | 0.25 | 2.75 | 2.25 |
| States/Explains Nonacademic[b] | -- | -- | -- | -- | 2.88 | 1.00 | 0.25 | 1.00 |
| Requests[b] | -- | -- | -- | -- | 1.00 | 1.00 | 1.50 | 0.75 |

[a]The categories Shows Animation and Listens were eliminated after Round II.

[b]The categories Requests and States/Explains Nonacademic were separated from Commands and States/Explains for Rounds IV and V.

TABLE C-4

Student Engagement Behavior Frequencies Recorded by Calibrators and Observers (Mean for Calibration Periods for Each Round)

| Behavior | Round I | | Round II | | Round IV | | Round V | |
|---|---|---|---|---|---|---|---|---|
| | Cal. | Obs. | Cal. | Obs. | Cal. | Obs. | Cal. | Obs. |
| Motor Engaged | 12.25 | 4.50 | 11.50 | 11.50 | 12.88 | 13.13 | 10.25 | 9.75 |
| Motor Disengaged | 14.50 | 8.75 | 3.00 | 13.50 | 2.00 | 4.25 | 2.25 | 1.75 |
| Verbal Engaged | 1.75 | 2.50 | 4.50 | 6.50 | 1.50 | 2.50 | 2.00 | 3.50 |
| Verbal Disengaged | 3.50 | 3.25 | 4.50 | 0.50 | 1.38 | 0.63 | 2.50 | 1.25 |
| Visual Engaged | 19.25 | 18.50 | 20.00 | 21.00 | 24.38 | 21.13 | 24.75 | 24.25 |
| Visual Disengaged | 9.75 | 7.00 | 5.50 | 5.00 | 5.00 | 7.75 | 4.25 | 4.50 |
| Global Receptive | 8.75 | 11.75 | 14.00 | 9.00 | 10.13 | 7.75 | 13.25 | 13.25 |
| Global Expressive | 10.75 | 6.50 | 8.50 | 12.00 | 14.00 | 14.00 | 11.25 | 11.25 |
| Global Passive | 9.25 | 5.25 | 7.00 | 4.50 | 4.25 | 6.50 | 2.50 | 3.25 |
| Global Disruptive | 0.75 | 2.00 | 0.00 | 0.00 | 1.25 | 0.50 | 2.00 | 1.25 |
| Nontask Direction | 9.50 | 7.75 | 1.50 | 2.50 | 5.63 | 5.25 | 4.25 | 4.25 |
| Teacher Direction | 7.50 | 7.00 | 4.50 | 3.00 | 6.88 | 6.00 | 14.00 | 16.00 |
| Aide Direction[a] | -- | -- | -- | -- | 0.25 | 0.38 | 0.00 | 0.00 |
| Material Direction | 12.00 | 10.75 | 22.00 | 18.50 | 17.50 | 15.63 | 11.00 | 8.50 |
| Peer Direction | 0.00 | 0.50 | 1.50 | 0.00 | 0.38 | 1.00 | 0.25 | 4.25 |
| Dyadic Grouping | 0.00 | 0.50 | 1.50 | 2.50 | 1.00 | 1.13 | 0.50 | 0.75 |
| Small Group | 3.00 | 2.00 | 3.00 | 2.50 | 0.75 | 0.88 | 0.00 | 0.00 |
| Large Group | 21.25 | 22.50 | 23.00 | 21.00 | 27.75 | 26.75 | 28.50 | 28.50 |

[a]The category Aide Direction was added for Rounds IV and V.

# APPENDIX D

## TEACHER STRATEGIES DATA

TABLE D-1

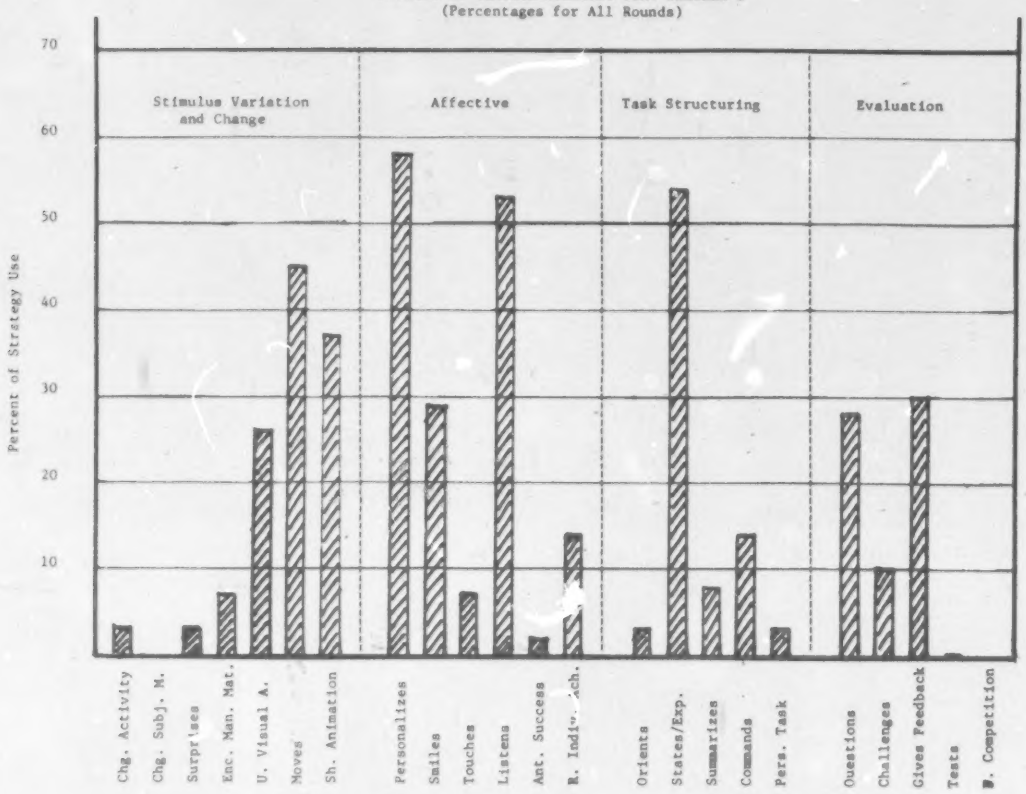
Teacher Strategy Use
(Percentages for All Rounds)

| Teacher Code | Stimulus Variation and Change Strategies | | | | | | | Affective Strategies | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Chg.Act. | Chg.S.M. | Surp. | E.Man.M. | U.Vis.A. | Moves | Sh.Anim. | Pers. | Smiles | Touches | Listens | A.Suc. | R.I.A. |
| 1 | 3 | 0 | 3 | 7 | 26 | 45 | 37 | 58 | 29 | 7 | 53 | 2 | 14 |
| 2 | 2 | 1 | 0 | 14 | 10 | 24 | 22 | 55 | 33 | 6 | 19 | 2 | 8 |
| 3 | 3 | 2 | 0 | 8 | 18 | 54 | 33 | 43 | 16 | 4 | 33 | 1 | 7 |
| 4 | 2 | 0.1 | 0 | 17 | 21 | 28 | 3 | 30 | 35 | 6 | 24 | 1 | 7 |
| 5 | 1 | 0.1 | 0.1 | 19 | 12 | 55 | 4 | 50 | 5 | 5 | 28 | 3 | 1 |
| 6 | 3 | 0.4 | 0 | 9 | 14 | 25 | 25 | 46 | 10 | 2 | 13 | 1 | 5 |
| 7 | 1 | 0.1 | 0 | 0.3 | 13 | 26 | 2 | 54 | 4 | 7 | 35 | 2 | 4 |
| 8 | 1 | 0.1 | 0 | 3 | 31 | 43 | 11 | 44 | 14 | 4 | 56 | 0.3 | 3 |
| 9 | 2 | 0 | 0 | 3 | 26 | 30 | 4 | 48 | 15 | 2 | 34 | 1 | 3 |
| 10 | 4 | 0.1 | 0 | 7 | 13 | 39 | 31 | 57 | 22 | 7 | 49 | 2 | 12 |
| 11 | 4 | 0.3 | 1 | 4 | 14 | 17 | 6 | 57 | 29 | 3 | 42 | 2 | 9 |
| 12 | 2 | 0.4 | 0 | 5 | 16 | 33 | 11 | 61 | 4 | 2 | 25 | 2 | 4 |
| 13 | 3 | 0.3 | 0.1 | 5 | 23 | 32 | 6 | 60 | 9 | 2 | 56 | 1 | 9 |
| 14 | 3 | 1 | 0.1 | 5 | 35 | 23 | 20 | 65 | 13 | 1 | 68 | 1 | 5 |
| 15 | 4 | 0.3 | 0 | 16 | 36 | 52 | 9 | 56 | 13 | 8 | 16 | 2 | 9 |
| 16 | 4 | 0.4 | 0.2 | 4 | 13 | 43 | 5 | 55 | 12 | 4 | 31 | 1 | 11 |
| 17 | 2 | 1 | 0 | 11 | 37 | 25 | 5 | 62 | 9 | 3 | 33 | 1 | 2 |
| 18 | 2 | 0.3 | 0 | 1 | 10 | 27 | 37 | 61 | 26 | 5 | 44 | 1 | 8 |
| 19 | 1 | 0 | 0 | 4 | 30 | 36 | 37 | 69 | 33 | 6 | 39 | 1 | 4 |
| 20 | 4 | 1 | 0.1 | 18 | 28 | 51 | 4 | 45 | 5 | 3 | 6 | 1 | 4 |
| 21 | 2 | 0.1 | 0 | 17 | 27 | 43 | 2 | 34 | 4 | 1 | 33 | 0 | 1 |
| 22 | 2 | 0.1 | 1 | 6 | 13 | 30 | 26 | 62 | 27 | 6 | 21 | 0.4 | 5 |
| 23 | 1 | 0 | 0 | 0.4 | 7 | 36 | 19 | 51 | 19 | 8 | 61 | 1 | 5 |
| 24 | 2 | 1 | 0 | 8 | 21 | 41 | 18 | 54 | 24 | 5 | 31 | 2 | 13 |

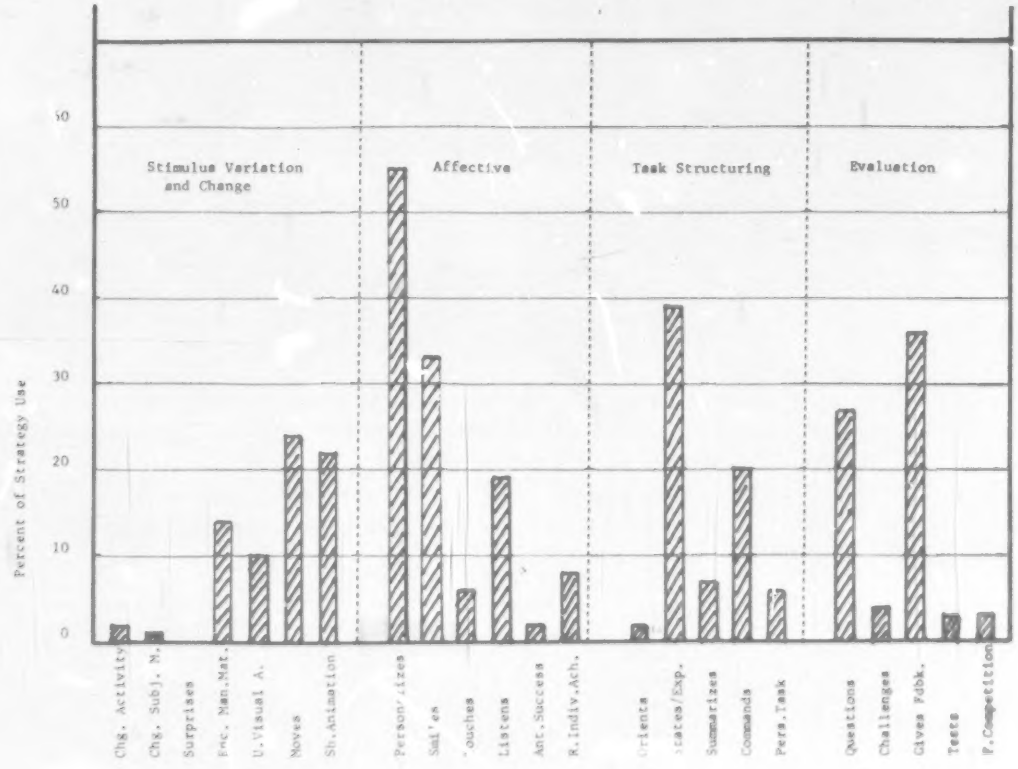
Table D-1 (cont'd.)

| Teacher Code | Task Structuring Strategies | | | | | Evaluative Strategies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Orients | Sts./Exp. | Sums. | Comds. | P.Tsk. | Quest. | Chall. | G.Fdbk. | Tests | F.Comp. |
| 1 | 3 | 54 | 8 | 14 | 3 | 28 | 10 | 30 | 0.1 | 0 |
| 2 | 2 | 39 | | 20 | 6 | 27 | 4 | 36 | 3 | 3 |
| 3 | 4 | 50 | 6 | 26 | 2 | 29 | 9 | 22 | 3 | 2 |
| 4 | 1 | 45 | 4 | 16 | 13 | 22 | 9 | 34 | 0.1 | 1 |
| 5 | 2 | 52 | 4 | 32 | 8 | 31 | 4 | 26 | 0 | 1 |
| 6 | 4 | 52 | 6 | 45 | 2 | 34 | 6 | 27 | 1 | 1 |
| 7 | 8 | 42 | 2 | 24 | 6 | 41 | 2 | 28 | [illegible] | 1 |
| 8 | 5 | 45 | 4 | 20 | 0.1 | 23 | 4 | 17 | 4 | 1 |
| 9 | 2 | 51 | 6 | 16 | 3 | 30 | 7 | 14 | 0 | 0.1 |
| 10 | 3 | 53 | 6 | 17 | 3 | 24 | 6 | 25 | 6 | 1 |
| 11 | 5 | 39 | 4 | 20 | 13 | 35 | 7 | 38 | 0.4 | 1 |
| 12 | 1 | 48 | 6 | 35 | 4 | 43 | 5 | 27 | 6 | 0.3 |
| 13 | 2 | 50 | 6 | 16 | 6 | 32 | 7 | 25 | 7 | 2 |
| 14 | 4 | 41 | 7 | 15 | 1 | 44 | 7 | 31 | 4 | 6 |
| 15 | 2 | 40 | 9 | 27 | 4 | 32 | 8 | 37 | 0 | 3 |
| 16 | 2 | 40 | 4 | 17 | 5 | 24 | 11 | 36 | 0 | 2 |
| 17 | 3 | 41 | 7 | 21 | 6 | 53 | 3 | 24 | 7 | 2 |
| 18 | 2 | 45 | 9 | 19 | 5 | 37 | 13 | 33 | 0 | 0.3 |
| 19 | 3 | 47 | 8 | 13 | 2 | 36 | 9 | 28 | 0 | 2 |
| 20 | 2 | 45 | 4 | 18 | 1 | 24 | 3 | 25 | 13 | 5 |
| 21 | 4 | 49 | 9 | 11 | 6 | 27 | 4 | 19 | 0 | 1 |
| 22 | 7 | 53 | 6 | 15 | 16 | 27 | 3 | 32 | 18 | 0.4 |
| 23 | 3 | 43 | 4 | 9 | 3 | 28 | 5 | 17 | 0 | 0 |
| 24 | 7 | 34 | 8 | 25 | 2 | 21 | 2 | 29 | 8 | 8 |

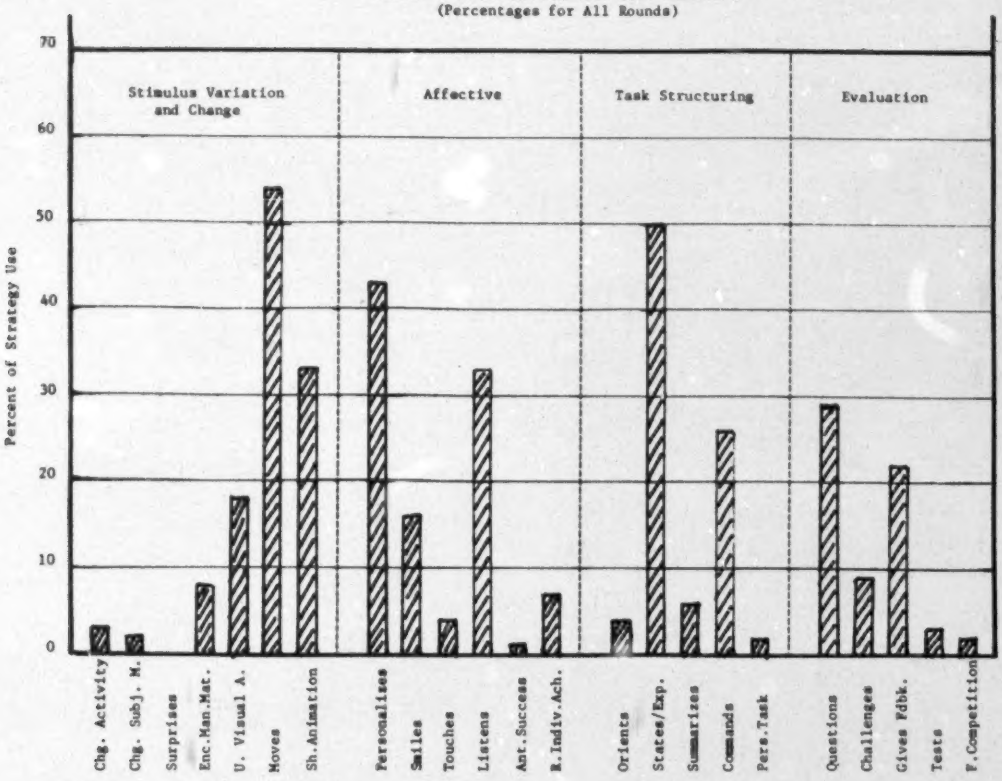
PROFILE OF TEACHER STRATEGY USE: TEACHER 1
(Percentages for All Rounds)



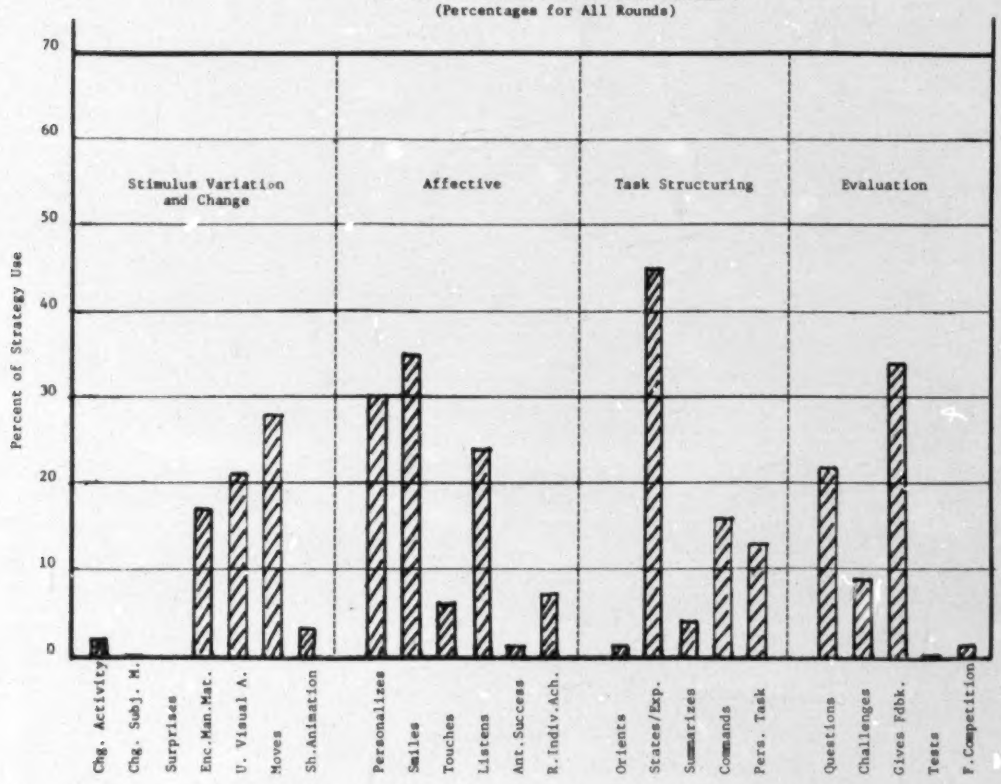

PROFILE OF TEACHER STRATEGY USE: TEACHER 2
(Percentages for All Rounds)



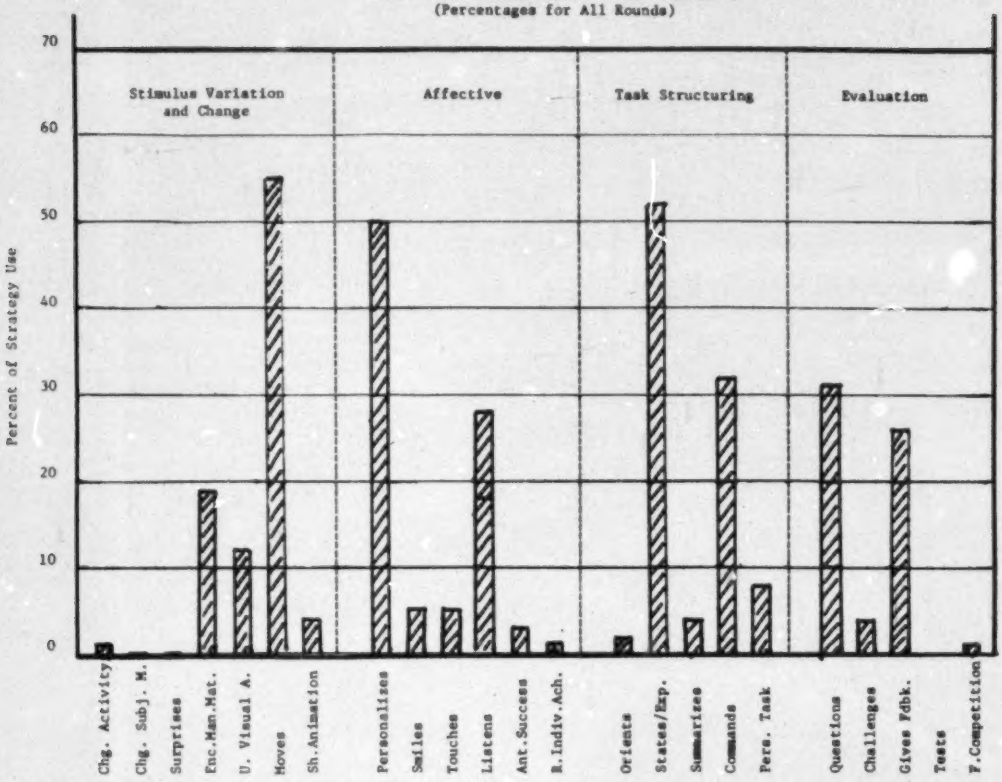
PROFILE OF TEACHER STRATEGY USE: TEACHER 3
(Percentages for All Rounds)



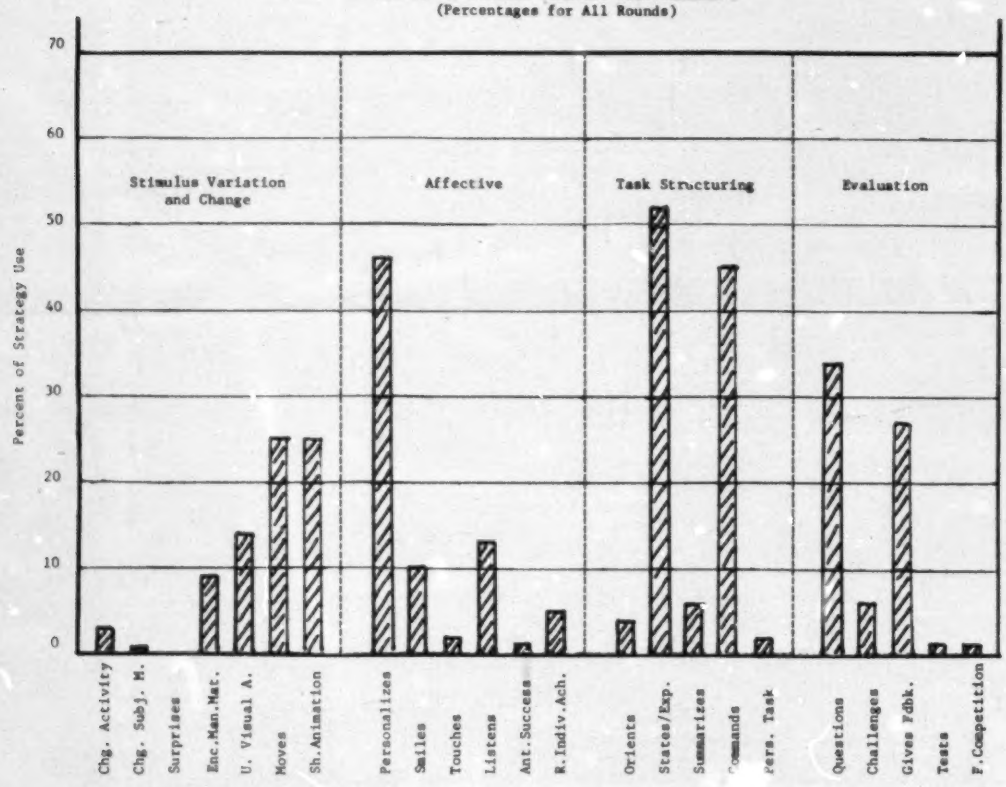

PROFILE OF TEACHER STRATEGY USE: TEACHER 4
(Percentages for All Rounds)



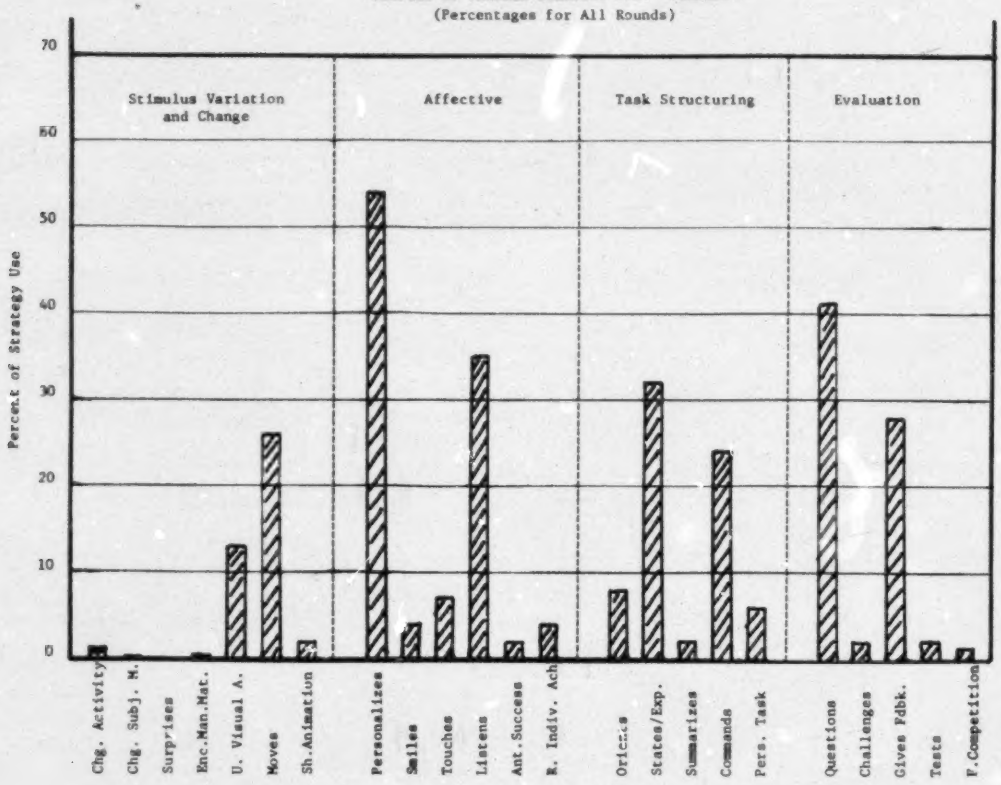
PROFILE OF TEACHER STRATEGY USE: TEACHER 5
(Percentages for All Rounds)



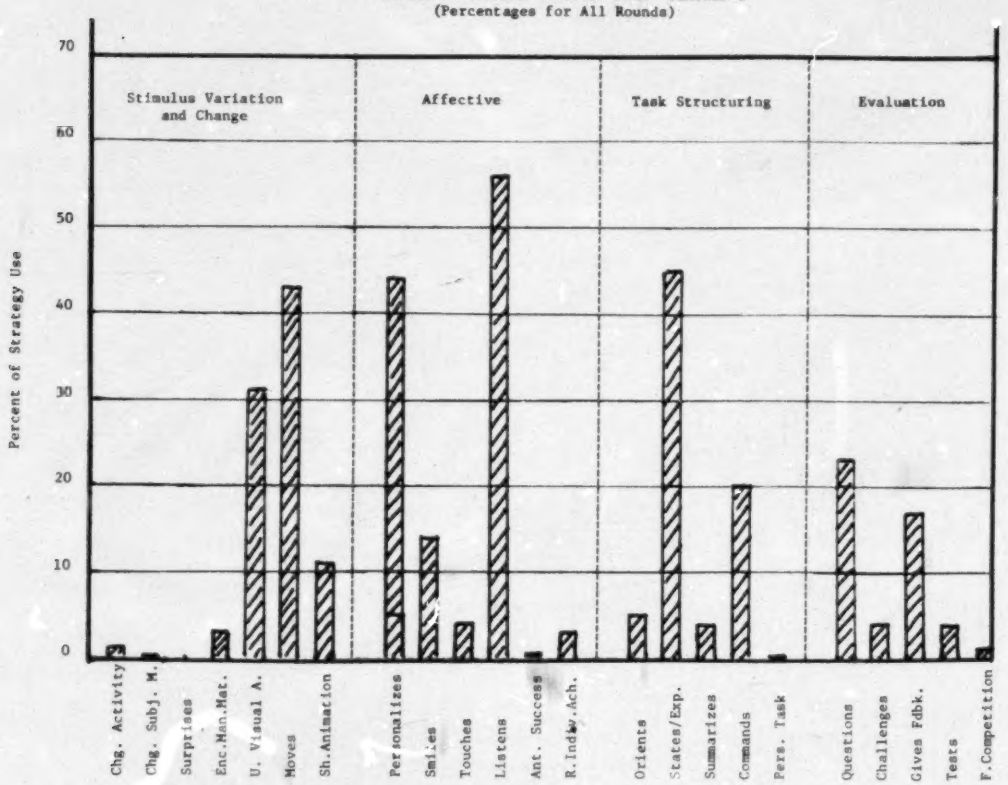

PROFILE OF TEACHER STRATEGY USE: TEACHER 5
(Percentages for All Rounds)



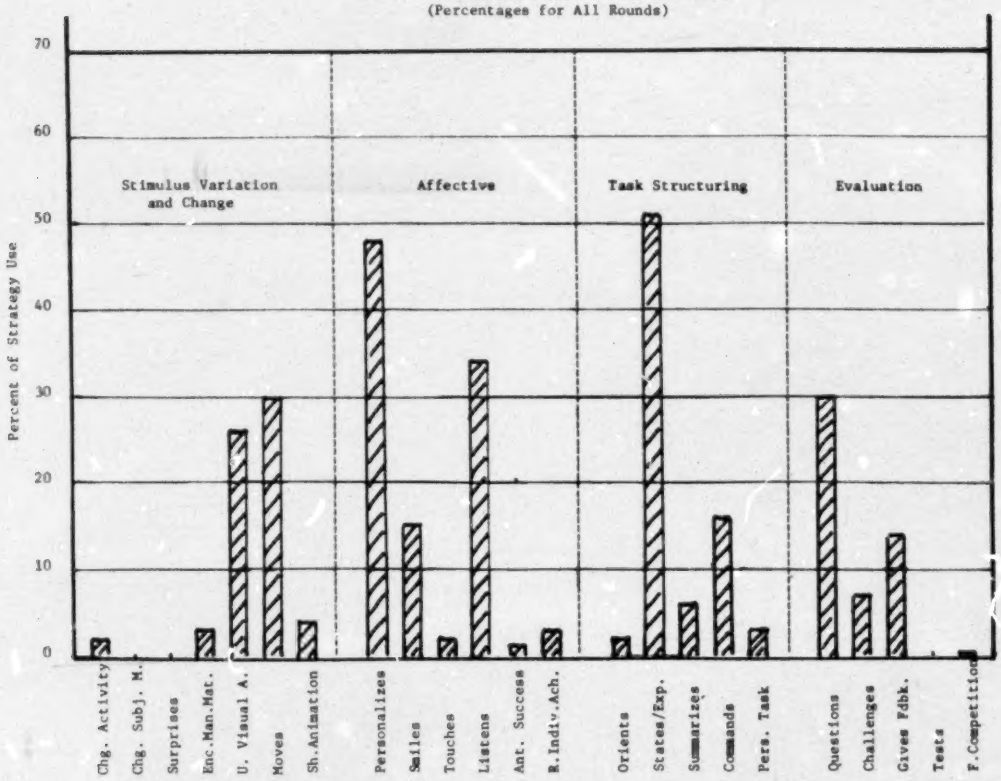
PROFILE OF TEACHER STRATEGY USE: TEACHER 7
(Percentages for All Rounds)



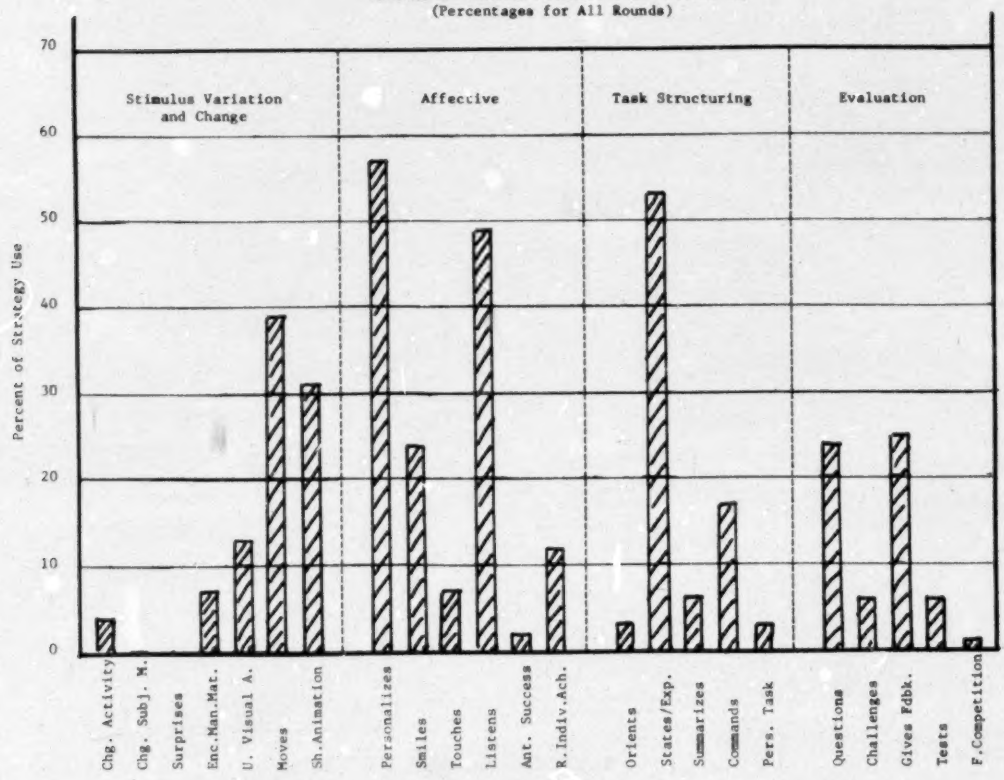

PROFILE OF TEACHER STRATEGY USE: TEACHER 8
(Percentages for All Rounds)



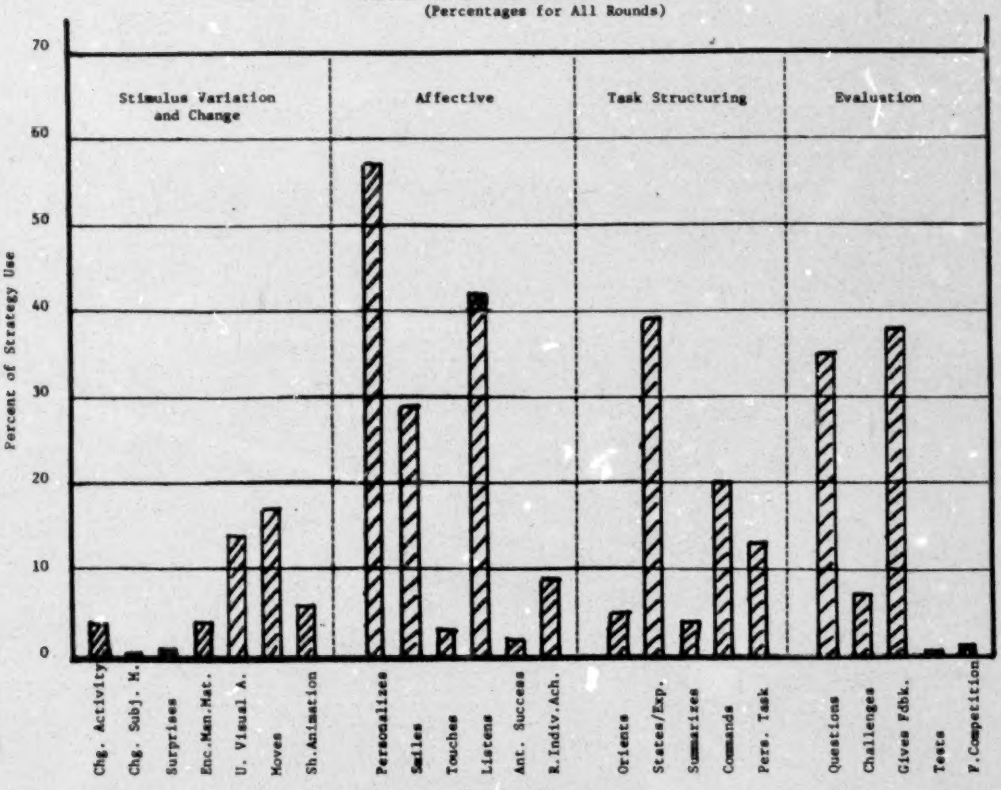
PROFILE OF TEACHER STRATEGY USE: TEACHER 9
(Percentages for All Rounds)



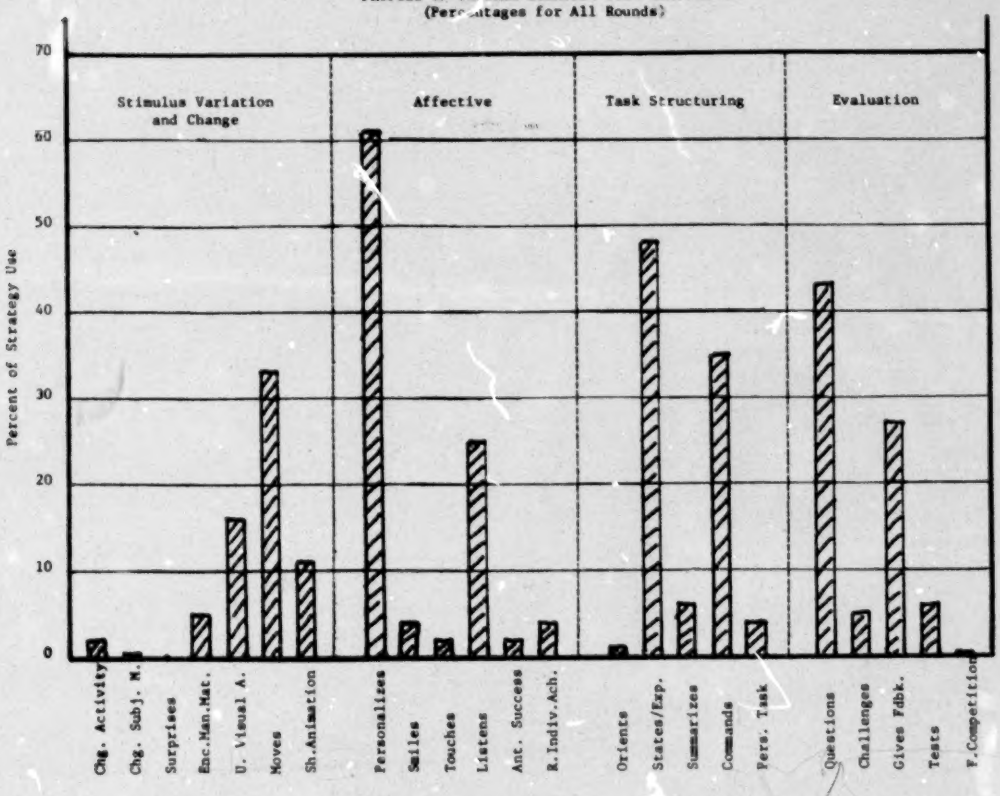

PROFILE OF TEACHER STRATEGY USE: TEACHER 10
(Percentages for All Rounds)



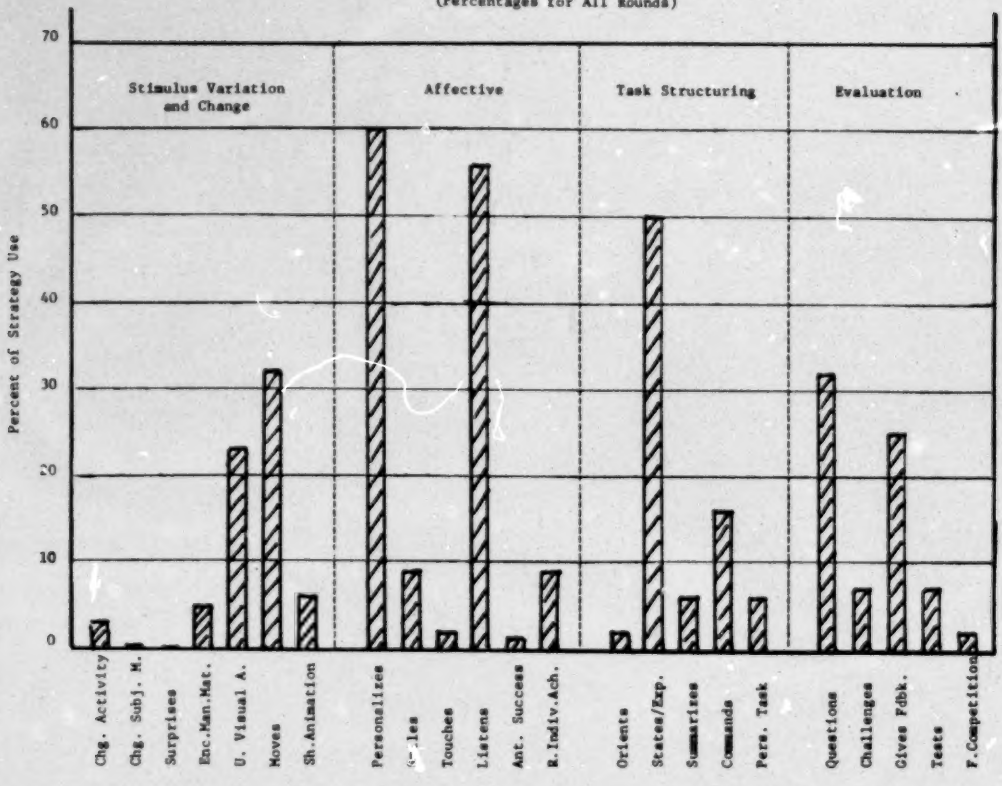
PROFILE OF TEACHER STRATEGY USE: TEACHER 11
(Percentages for All Rounds)



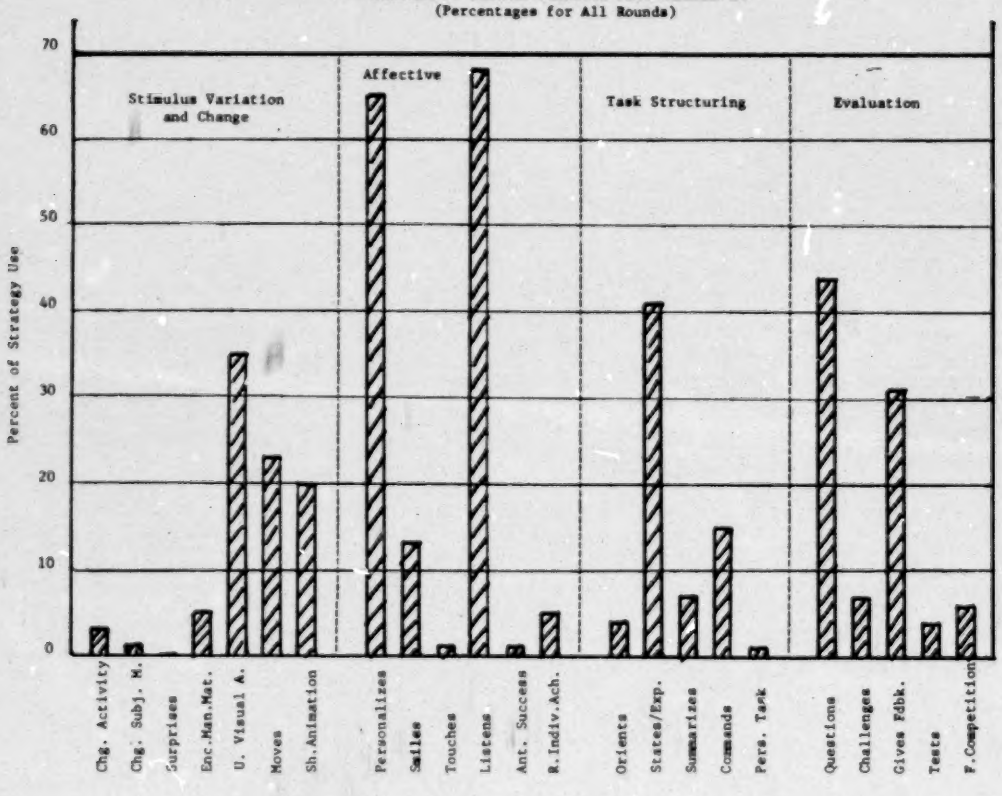

PROFILE OF TEACHER STRATEGY USE: TEACHER 12
(Percentages for All Rounds)



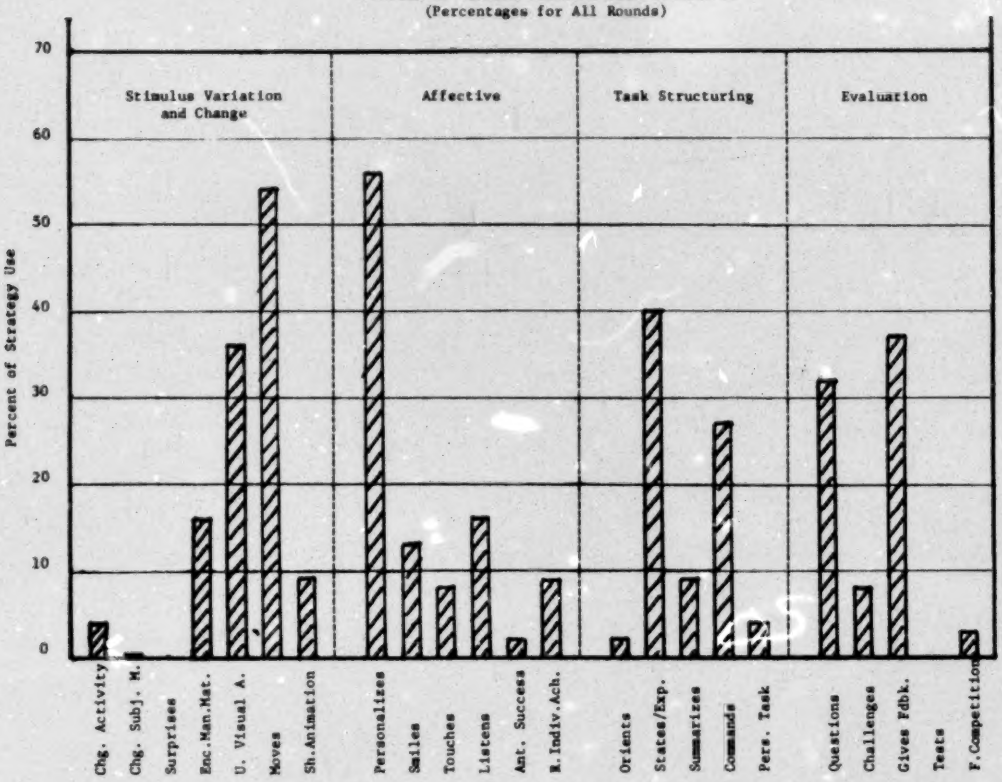
PROFILE OF TEACHER STRATEGY USE: TEACHER 13
(Percentages for All Rounds)



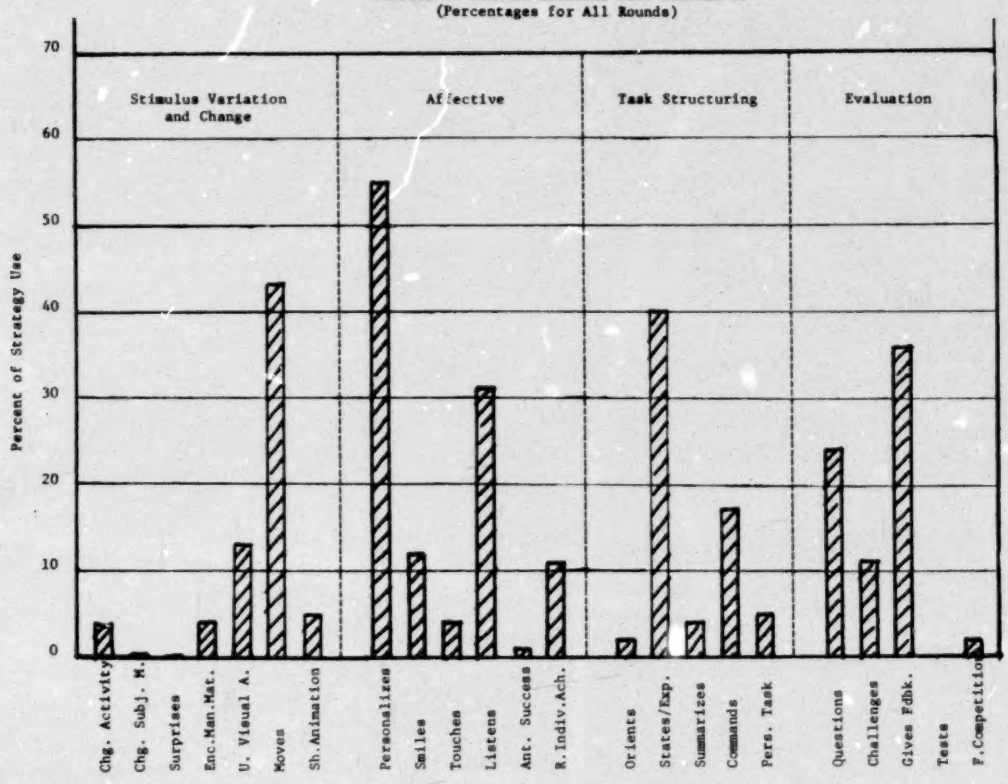

PROFILE OF TEACHER STRATEGY USE: TEACHER 14
(Percentages for All Rounds)



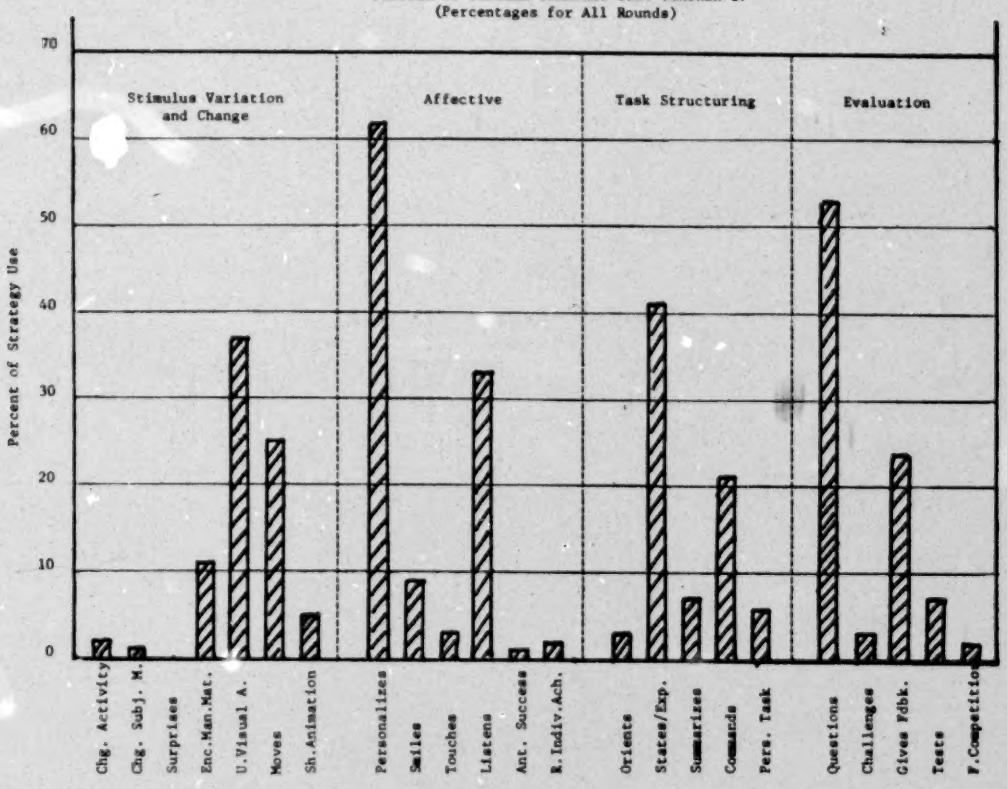
PROFILE OF TEACHER STRATEGY USE: TEACHER 15
(Percentages for All Rounds)



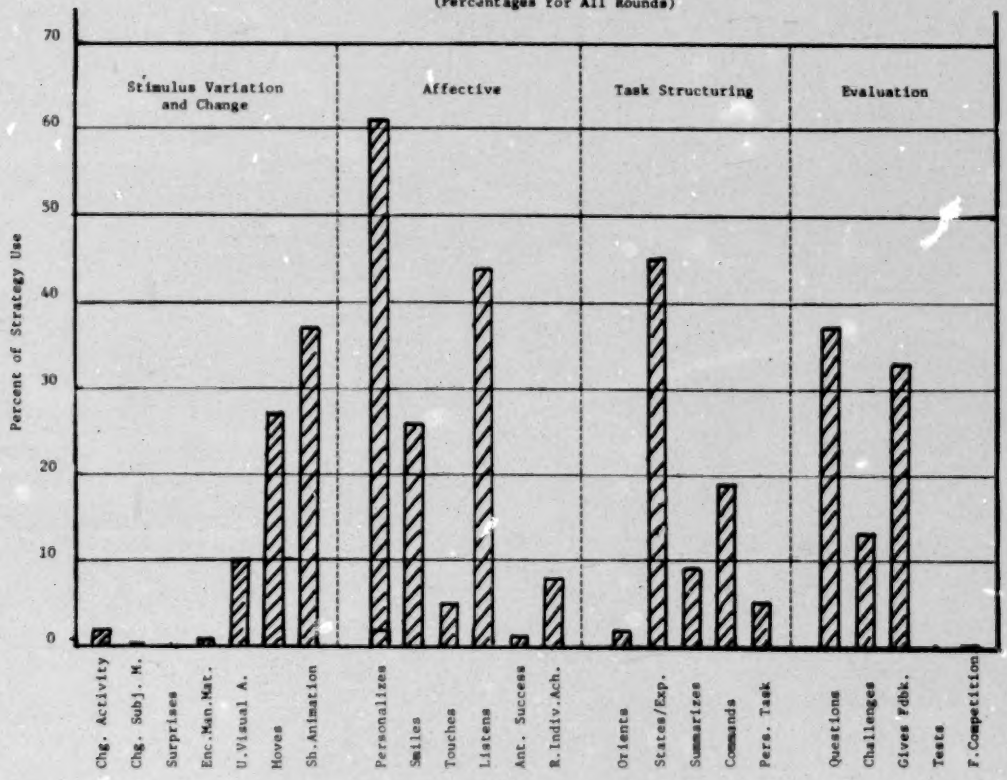

PROFILE OF TEACHER STRATEGY USE: TEACHER 16
(Percentages for All Rounds)



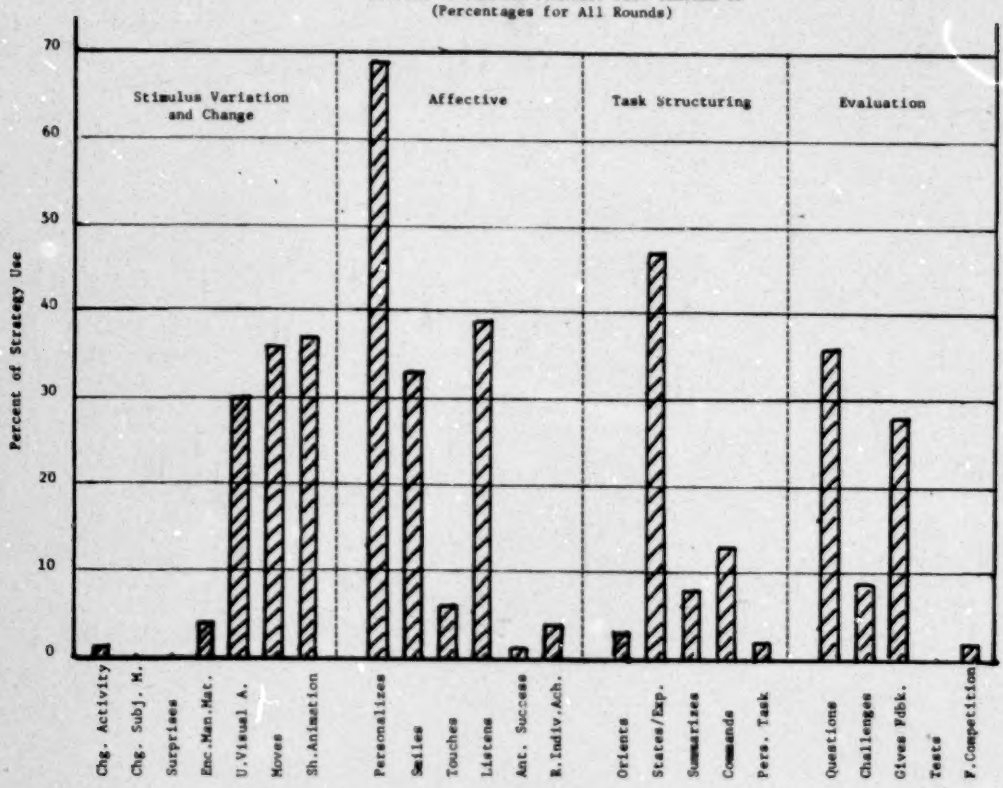
PROFILE OF TEACHER STRATEGY USE: TEACHER 17
(Percentages for All Rounds)



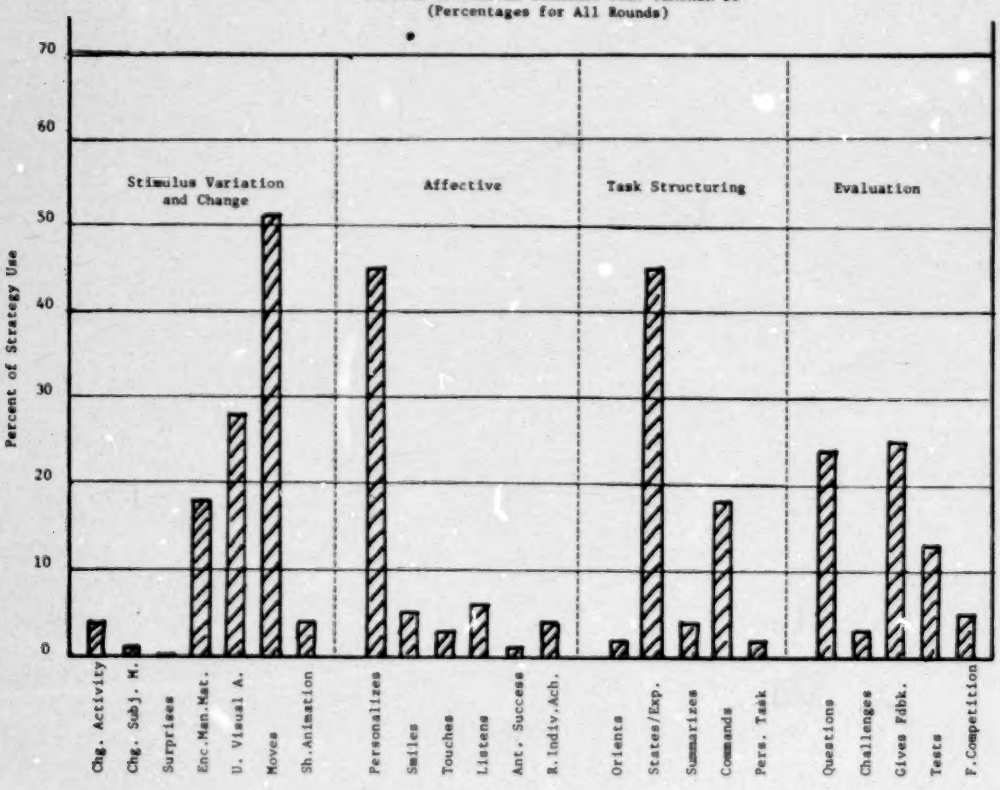

PROFILE OF TEACHER STRATEGY USE: TEACHER 18
(Percentages for All Rounds)



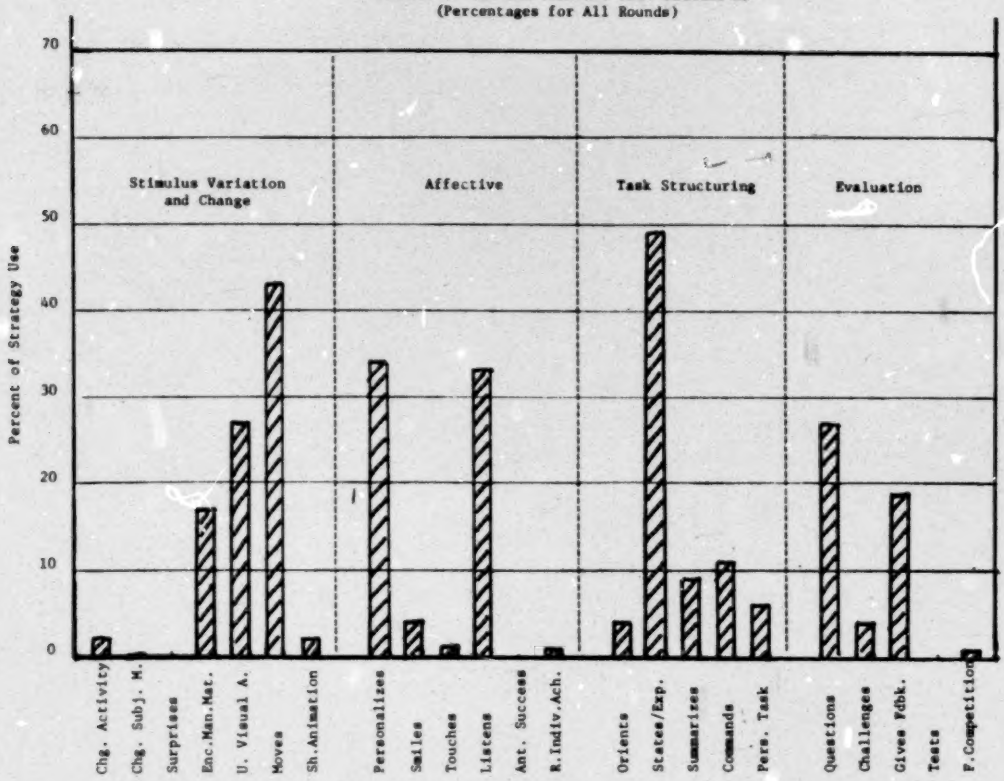
PROFILE OF TEACHER STRATEGY USE: TEACHER 19
(Percentages for All Rounds)



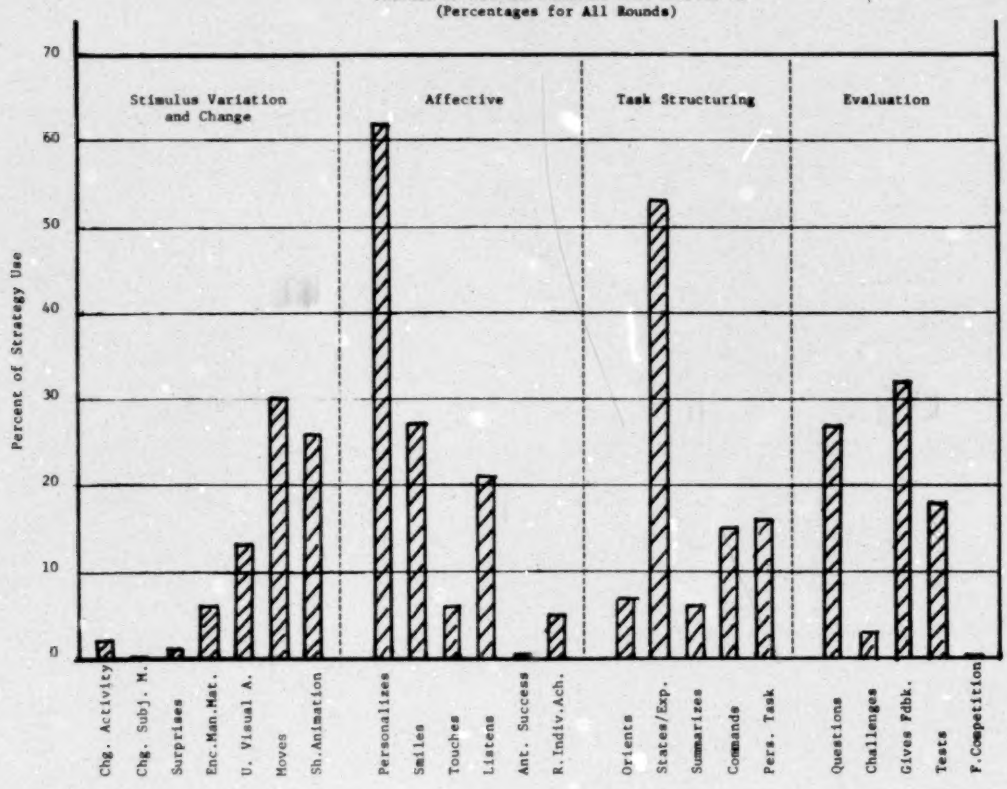

PROFILE OF TEACHER STRATEGY USE: TEACHER 20
(Percentages for All Rounds)



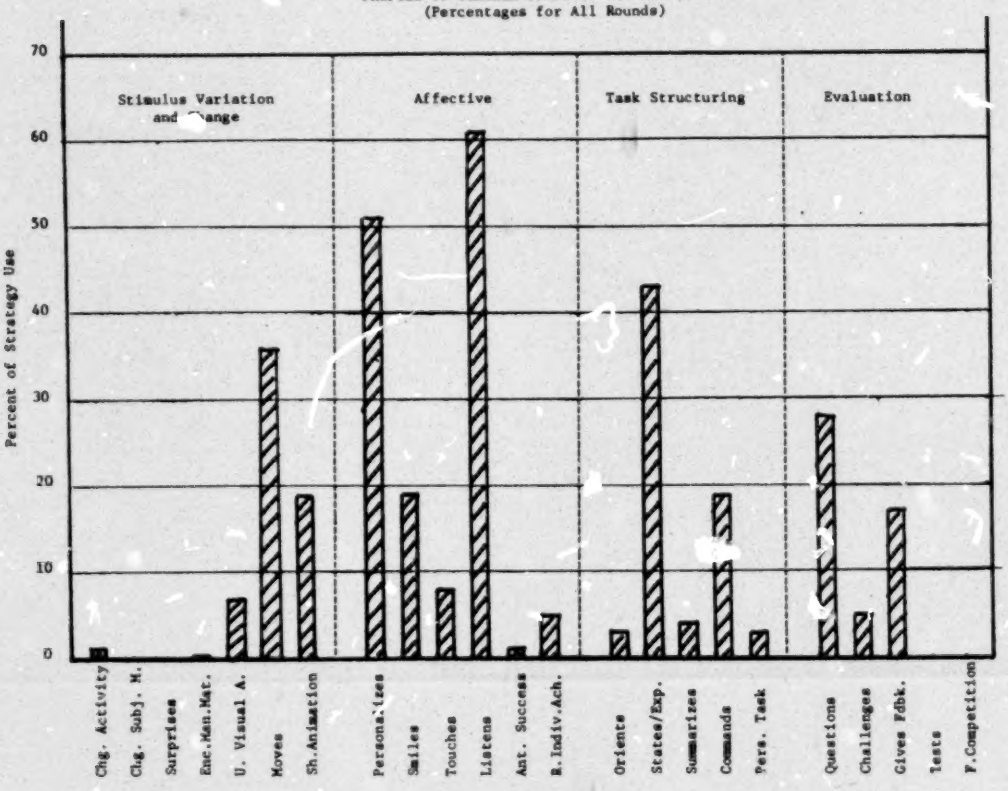
PROFILE OF TEACHER STRATEGY USE: TEACHER 21
(Percentages for All Rounds)




PROFILE OF TEACHER STRATEGY USE: TEACHER 22
(Percentages for All Rounds)



PROFILE OF TEACHER STRATEGY USE: TEACHER 23
(Percentages for All Rounds)




PROFILE OF TEACHER STRATEGY USE: TEACHER 24
(Percentages for All Rounds)